THREATENING DYSTOPIAS: DEVELOPMENT POLITICS AND THE ANTICIPATION OF CLIMATE CRISIS IN BANGLADESH

A Dissertation

Presented to the Faculty of the Graduate School

of Cornell University

In Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

by

Kasia Paprocki

August 2017

THREATENING DYSTOPIAS: DEVELOPMENT POLITICS AND THE ANTICIPATION OF CLIMATE CRISIS IN BANGLADESH

Kasia Paprocki, Ph. D.

Cornell University 2017

In the broadest sense, this is a study of competing imaginations of the future under climate change, and struggles over the power to shape that future. Who gets to imagine what the future will look like? What are the material implications of those imaginations? How do certain imaginations of the future become reality, while others are silenced and foreclosed? How is the power to determine the future exercised? I answer these questions through an exploration of the intersection of development and climate change adaptation in Bangladesh, and the various actors that shape and contest it.

Development in Bangladesh is increasingly defined by and through an *adaptation regime*, a socially and historically specific configuration of power that governs the landscape of possible intervention in the face of climate change. It includes institutions of development, research, media, and science, as well as various state actors both nationally and internationally. This adaptation regime works by de-historicizing and de-politicizing the dynamics of ecological change, legitimizing new interventions by donors, policy makers, researchers, and development agencies. By marshaling significant funding, infrastructure and political capital, the adaptation regime constitutes a new form of governance over the livelihoods seen as viable in the near- and long-term future. The politics of uncertainty over whether, how, and when to adapt also enroll the scientific and research communities in activities of the regime. Strategies for pursuing "viable"

futures in the time of climate change range from the promotion of saline shrimp aquaculture in former rice farming communities to plans for resettling the populations of entire geographic regions.

In this dissertation, I trace the rise of this regime from its colonial antecedents to the present, investigate the range of actors that have contributed to its emergence, and examine a variety of ways in which its impacts are experienced in communities in coastal Bangladesh. I focus on three communities that have taken different paths regarding shrimp cultivation, and that have variously mobilized against it. Their experiences and struggles challenge the notion that agriculture is no longer viable in their region, and suggest new possibilities for equitable futures in rural Bangladesh and beyond.

BIOGRAPHICAL SKETCH

Kasia Paprocki completed a B.A. in Development in the Global South at Hampshire College in 2007. Before entering graduate school, she conducted research for the Chicago-based Goldin Institute on the impacts of microcredit in rural communities in Bangladesh, alongside Bangladesh's largest landless peasant movement, Nijera Kori. In 2010, she began the M.S./Ph.D. program in the Department of Development Sociology at Cornell University. As a graduate student, she was a National Science Foundation Graduate Research Fellow, a Social Science Research Council International Dissertation Research Fellow, and a Fulbright-Hays Fellow. As of August 2017, she is Assistant Professor in Environment in the Department of Geography and Environment at the London School of Economics and Political Science.

Dedicated to the memories of Karunamoyee Sardar and Xulhaz Mannan, and the brave activists who honor them by continuing their struggles

ACKNOWLEDGMENTS

My first thanks go to the members and organizers of Nijera Kori, to whom I owe the greatest debt for their boundless generosity in teaching me about development, agrarian change, social mobilization, and their own day-to-day struggles over the power to shape each of these. I first visited Khulna in 2012 at the urging of Nijera Kori organizers. I thus have them to thank for leading me to the initial stages of this dissertation project, as well as for helping me learn how to ask the right kinds of questions. I have used pseudonyms to refer to Nijera Kori members throughout the book, and am thus sadly unable to thank them here by name, although I feel a tremendous debt to several individuals personally as well as the movement as a collective. They welcomed me into their community and their lives, gave me a considerable amount of time and green coconuts, taught me how to plant rice (and were good-natured about the sloppy results), expressed deep and earnest interest in both my work and my personal life, and responded warmly when I expressed the same interest in theirs. Nijera Kori staff in Paikgachha, Dumuria, Khulna, and Dhaka have offered abundant amounts of time, shared their extensive insights, taken care of me when I was sick, and given me rides on the backs of their motorcycles. I hope that I have honored them and the experiences they have shared with me in my attempts to represent them.

Among these activists, two people in particular shaped this work in truly foundational ways. Rose Rahman has offered an unimaginable amount of time, support, and wisdom, and in the process has become a treasured research collaborator, colleague and friend. I have been honored to have the opportunity to observe his work as a community organizer in villages all over rural Bangladesh, from large crowds to intimate conversations. Alongside these community members, I have been inspired by his incisive analysis, commitment to authentic understanding, and passion for the movement. It would be impossible to list all the ways in which Khushi Kabir supported me both personally and professionally in conducting this research. I feel incredibly privileged to have had the opportunity for over a decade to observe closely her unparalleled leadership, determination and perseverance in fighting for the civil and human rights of women, laborers, and rural communities. Her strength and political will have made me aspire me at every step to

understand more and better and to work harder. My research and I have benefited tremendously from her support, her mentorship, and her friendship, and I will be forever grateful to her for inviting me into the movement and into her family.

The work would not have been possible materially without generous funding from several institutions, including the National Science Foundation, the Social Science Research Council, the Fulbright-Hays Program, the American Institute of Bangladesh Studies, and Inter Pares. At Cornell, I also received support from the Atkinson Center for a Sustainable Future, the Department of Crop and Soil Sciences, the Mario Einaudi Center, the Department of Development Sociology, and the South Asia Program. I thank each of them for facilitating the luxury of considerable time and space to think, write, and ask questions.

I am grateful for the expertise and generosity of several librarians and archivists who offered their support and knowledge on several aspects of my research. I am thankful to the staff of the following archives and libraries: The National Library, Kolkata, The National Archives of India in Delhi, The Center for Environmental and Geographic Information Services (CEGIS) in Dhaka, the library at the Institute of Water and Flood Management at BUET in Dhaka, the British Library, the Wageningen University Library, and the U.S. National Archives at College Park, MD. At the Wageningen library, Zach Lamb was a terrific research collaborator and interlocutor. Ashim Mukhopadhyay at the National Library, Kolkata, a self-identified leftist, took a keen interest in my research, and without his support in the archives, I likely would not have pursued the extensive archival research that facilitated the historic analysis in Chapter 1. Additionally, Gertrud and Helmut Denzau have painstakingly compiled a staggeringly impressive personal archive of materials related to the Sundarban region in their home in northern Germany. I am enormously grateful to them for for opening their home and their library to me and for their scholarly contributions in amassing this collection.

Friends and colleagues at Cornell have offered intellectual challenges and support, as well as companionship, in particular Andrew Amstutz, Ian Bailey, Evren Dincer, Sara Keene, Kathy Sexsmith, Divya Sharma, Greg Thaler, as well as the members of Wendy Wolford's lab group

during my time as a graduate student (including Alice Beban, Jenn Blesh, Youjin Chung, Hilary Faxon, Tim Gorman, Ryan Nehring, Karla Peña, Ewan Robinson, Fernando Galeana Rodriguez, and Marygold Walsh-Dilley). The lab group was a particular source of support, and I thank its various members for feedback on drafts of proposals and chapters at their most incipient stages, and for their commitment to constructive engagement as well as a shared understanding of the political promises and responsibilities of critical ethnography. I greatly benefited from discussions with several Cornell faculty throughout my time there, including Fouad Makki, Chuck Geisler, Marina Welker, Ray Craib, and Anne Blackburn. Shelly Feldman was my first advisor at Cornell, and I am grateful to her for deep commitment to rigorous and nuanced academic inquiry, her regard for the political potential of critical academic work, and her attention to the interrelations between the personal, the political, and the intellectual.

Beyond Cornell, several institutions have also provided intellectual communities for me during the process of research and writing. The South Asia Program was a second intellectual home at Cornell, and I learned a great deal from ongoing conversations with affiliated graduate students and faculty; their support through two years of Foreign Language and Area Studies Fellowships facilitated essential language and area studies training. In India, an affiliation with the Global Change Program at Jadavpur University in Kolkata facilitated stimulating intellectual exchange, in particular with Joyashree Roy, who facilitated introductions to several key interlocutors in West Bengal. In Bangladesh, an affiliation with the International Centre for Climate Change and Development facilitated greater access to the robust professional community concerned with climate change in Dhaka, and I benefited in particular from conversations with Saleemul Huq, whose professional and political commitments have shaped my own understanding of and commitment to climate politics in Bangladesh and beyond. While I was writing up, the Institute for Public Knowledge at NYU welcomed me as a Visiting Scholar with the space for writing and perceptive feedback, collegiality, and friendships. Likewise, Yale's Program in Agrarian Studies and Environmental Anthropology Collective provided invaluable communities for

intellectual exchange, support, and learning, and I am particularly grateful to Shivi for inviting me to participate in both.

Elsewhere, my dissertation and I have greatly benefited from discussion, feedback, questions and provocations from Shapan Adnan, Daniel Ahlquist, Shapan Adnan, Nikhil Anand, Zach Anderson, Ben Belton, Jun Borras, Jim Boyce, George Caffentzis, Alejandro Camargo, Nusrat Chowdhury, Anjan Datta, Michael Eilenberg, Sylvia Federici, Amanda Flaim, David Gilmartin, Jenny Goldstein, Meghna Guhathakurta, Lotte Hoek, Jordan Husney, Malav Kanuga, Naveeda Khan, Sarah Knuth, David Ludden, Anu Muhammad, Dilshanie Perera, Shaina Potts, Dina Siddiqi, Chris Small, Michael Watts, and Sasha Wright. Various sections of the dissertation were improved through opportunities to share them with and receive critical feedback from attendees at several additional workshops and communities, including the SSRC InterAsian Assemblages Frontier Assemblages Workshop, the Institute for Public Knowledge Cities, Cultures, and Climate Change Working Group, the Denaturalizing Climate Change: Perspectives for Critical Adaptation Research workshop, the South Asia Program Graduate Student Symposium at Cornell, and the School of Geography and the Environment at Oxford University.

The support and companionship of several friends and colleagues while I was conducting fieldwork made Bangladesh feel like home. I am particularly grateful to Sara Afreen, Nasrin Akter, Manosh Chowdhury, Taheera Haq, Dina and Hameeda Hossain, David Jackman, Khushi Kabir, Rohini Kamal, David Ludden, Mathilde Maitrot, Mahrukh Mohiuddin, Helen Nazneen, Rose Rahman, Mahfia Begum Rita, Kamar Ahmed Saimon, Shateel Bin Salah, Dina Siddiqi, Kim and Jolyon Thomas, Hans Verkerke, Corey Watlington, Scott Wenger, Shamyu, Tuhin, and Tushar. Xulhaz Mannan was a great friend who supported my work in Bangladesh with advice, support, and companionship for over 10 years. He introduced me to the things that made me fall in love with Dhaka, indulged my text messages at all hours with inconsequential questions about navigating the city, and deepened and expanded my understanding of the cultural politics of Bangladesh, and the challenges faced by the country's sexual minorities. I wish I could have told him how much he would be missed.

My writing partner, Liz Koslov, has provided seemingly limitless intellectual and moral support, as well as near-daily companionship in dissertation writing. I have her, as well as Daniel Aldana Cohen, to thank for deepening my appreciation of the politics of climate justice, as well as a better understanding of the unique challenges climate change poses to urban communities. Liz's attention to the politics of coastal retreat on Staten Island have pushed me toward a more nuanced understanding of the range of possible responses to climate change in vulnerable communities, and the local power dynamics that shape the outcomes of those responses. I look forward to future collaborations on these questions of shared interest for several years to come.

I am forever indebted to Jason Cons for the unreasonable amount of time and support he has given me, and for his incomparable advice, mentorship, and friendship since we first met in 2006. Jason encouraged me to apply to graduate school, read and shared feedback on every application, grant proposal and article draft, taught me to better understand and appreciate *Capital*, worked alongside me in rural communities in Khulna, and has offered counsel and encouragement for this project since its inception. More than all of this, he, Erin Lentz, and Mira Cons have been family to us through the most difficult and the most joyful times. Along with Jason, I have benefited from the tremendous advice, support, and collective wisdom of a truly unparalleled committee of advisors. Durba Ghosh has gone well above and beyond in academic and professional mentorship; she has consistently provided insightful and deeply nuanced feedback that has expanded my disciplinary boundaries by helping me to see the broader intellectual stakes of my particular concerns, both within and beyond South Asia. She has coached me through navigating the personal and professional challenges of graduate school with integrity and sanity. It has been an honor to come to know and to work with Phil McMichael, whose textbook on development first led me to consider a career in Sociology as an undergraduate; his contributions to the field are unparalleled. He is a thoughtful and attentive reader, skilled at asking the most thought-provoking questions both in and outside of the classroom, and his irreverent wit makes it always feel like fun.

It was my greatest fortune to have the opportunity to learn from Wendy Wolford. Her own scholarship has inspired many of my most urgent intellectual and political questions and commitments. I have constantly felt her respect and her friendship as she has challenged my assumptions, pushed me in new directions, and expanded my expectations of myself. She has modeled and mentored me in pursuing the best of what it means to be a feminist in the academy. I aspire to the level of commitment, intellect, and passion that she embodies in her role as an educator, mentor, scholar, and activist.

My family has been a great source of inspiration, support, and good humor. Steve Paprocki's innate ethnographic sensibility instilled in me an aspiration to ask insightful questions and enthusiasm for great stories from a young age, as well as the greatest respect for working to pursue justice and equity. Kate Wesley's stories about growing up on a farm in Southern Minnesota fostered an early concern with the lived experience of rural life and agrarian change, as well as an eagerness to know more about the world. Ann Haugejorde, Michael and Marais Bjornberg, and Peter Schmidt have supported me with love, patience, and understanding when I was preoccupied with my work. My aunts, uncles, and cousins in the Paprocki family, especially Gary and Nell, have shared their homes, meals, laughter, and political passions, providing both respite from work, and reminders of why it is important. Anna Marschalk-Burns has been my best friend for almost 20 years and is the most gifted writer I know; her companionship while I was writing the dissertation never failed to comfort, encourage, and boost my spirits.

Anders Bjornberg has been my partner not only in life, but in every aspect of the work that is represented here, since our first visit to Bangladesh in 2006. It would be impossible to list all of the ways in which he contributed to this work as a reader, interlocutor, research assistant and companion. He has shared every excitement, happiness, anxiety, doubt, and passion with laughter, reassurance, and dedication. On the several occasions he has visited Khulna with me, his affable smile, sensitive questions, and charming ease with the Bengali language, have helped to endear me to the residents of villages where I have worked there, many of whom affectionately refer to him as *Dula Bhai* (Brother-in-Law). The dissertation has been immeasurably strengthened

through his ethnographic intuition, intellectual perceptiveness, thoughtful political instincts, and brilliant creative imagination. He has cooked, cleaned, and given me time and space with the utmost patience when I needed it, but also known when a distraction was what I needed more. I am infinitely thankful to him for filling my work and my life with laughter, adventure, and love.

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

Climate change in Bangladesh is everywhere and nowhere. This paradox plays out in newspaper headlines, foreign embassies, in the offices of the Prime Minister and the Planning Commission, NGOs, the World Bank, and UN agencies, at environmental protests, and in the villages on the coast of the Bay of Bengal, whose vulnerability is a source of constant speculation and intervention by those concerned with the country's development. Frequently referred to as the world's most vulnerable country to climate change (ADB 2012; Khan 2013; Nasiruddin and Sieghart 2014), the World Bank calls Bangladesh "the emerging 'hot spot' where climate threats and action meet."[1] Climate change has become the terrain on which Bangladesh engages with the world. It is increasingly the lens through which Bangladeshis represent themselves abroad; and, in turn, it is the primary means through which the world recognizes Bangladesh. This terrain of engagement was endorsed in 2015 when the United Nations awarded Prime Minister Sheikh Hasina the United Nations Champions of the Earth award for Bangladesh's initiatives to address climate change. Conversations in the country about climate change are ubiquitous. They wind their way into topics as diverse as rice agriculture (Roy 2014), garment manufacturing (Black 2013), microcredit (Micro loans offset effects 2014), and child marriage (Human Rights Watch 2015; TakePart 2017).[2] Addressing climate change is said to be necessary to the country's economic growth (Nakao and de Boer 2015), to becoming more democratic (Steele 2017) and more "cosmopolitan" (Climate Champions 2014).

[1] This phrase, which is representative of climate discourse throughout Bangladesh's development and donor community, appeared in 2014 in the third newsletter of the Bangladesh Climate Change Resilience Fund, a now-defunct multi-donor trust fund administered between 2010 and 2017. I expand on this discourse in Chapter 2.

[2] I thank Dina Siddiqi for this point about child marriage in a presentation she made at the 2017 Association for Asian Studies annual conference.

Bangladeshis also play a major role in international climate diplomacy, having organized and led the Less Developed Countries negotiating bloc in the UNFCCC negotiations since the bloc's inception. Claims about climate justice and climate action are ubiquitous amongst the country's massive NGO sector. These narratives focus on the responsibility for developed countries to pay for climate action in less developed countries as reparation for their historic greenhouse gas emissions.

Yet, when it comes to local political imaginaries, climate change rarely plays a role. Relative to this constant production of climate-related ideas, discourses, and interventions, climate change is surprisingly absent in local politics. It is rarely if ever invoked in local electoral campaigns, and politicians tend not to speak about it except in relation to the climate finance obligations of the developed world to Bangladesh. Activists concerned with civil and human rights rarely engage with questions of climate change and climate justice, and neither is it a significant political concern for the peasant social movements in coastal Khulna, the geographic focus of this dissertation as well as the object of many climate change adaptation interventions. While the environmental movement within the country is quite robust, local activists remain largely unconcerned with climate change, devoting their energies to specifically local ecological concerns, such as open-pit coal mining, pollution from power plants[3] and garment factories, and

[3] Protests against the proposed Rampal Power Plant are a case in point. This partnership between the Bangladeshi and Indian governments proposes to build a coal-fired power plant in Khulna, some nine to fourteen kilometers north of the boundaries of the Sundarban forest, one of the largest mangrove forests in the world. Rampal would be the country's largest power plant, although much of the power it generates would be exported across the border to neighboring India. Chief among the concerns cited by activists are the threats to Sundarban biodiversity, exacerbated by the inevitable increase in shipping traffic. Despite the government's professed commitment to climate action, they have rejected all efforts of activists to impede plans for this coal-fired power plant from moving forward. In 2016, the leader of the movement against Rampal, Anu Muhammad, received a series of death threats motivated by his work in the campaign that were traced to the cell phone of a high-ranking member of the ruling party (Sathi, 2016a). This was not the first indication of threats of violence made by the government against activists - another party member, and former environment minister, had previously suggested that Bangladeshi patriots might break the legs of activists who went too close to the proposed site for the plant (Sathi, 2016b). Activists decry the hypocrisy of a government that professes grave concern with the impacts of greenhouse gas emissions acting so

the impacts of shrimp aquaculture. These contradictions, between the primacy and absence of climate change in these competing Bangladeshi political imaginaries, suggest other dynamics are at play.

In this dissertation, I examine the conjunctural transformations of knowledge, environment, and political economy in coastal Bangladesh in the contemporary moment, both those that claim to be linked with climate change, and those that do not. In so doing, I demonstrate how the ubiquity of climate narratives precipitate an inherent teleology of climate dystopia. Seeing climate change everywhere fails to appreciate the conjunctural dynamics through which a climate-changed future is actively shaped, negotiated, and contested in the present. I argue that we need to understand how diverse and discrete transformations combine and interact with climate change, and what the implications are of assuming that they are all part of the same inevitable future crisis.

Climate change is a global phenomenon with effects that are increasingly felt all over the planet. But the ways its impacts will be manifested in particular places are not predetermined. People will not be able to choose just what the future will look like under climate change (indeed, many quite serious climatic shifts are already locked in), but they *will* shape that future through ongoing political struggles in the present (McMichael 2008). This conjunctural analysis of the experience of climate change in Bangladesh entails a methodological and historiographic choice - to understand the contradictions, contestations, and interactions among a variety of linked and synchronous processes in the current moment including climate change and otherwise (Li 2014; Wolford 2016).[4]

---

decisively to promote the burning of fossil fuels in a particularly vulnerable ecological zone. They also point out that if the Sundarbans are Bangladesh's primary defense against the cyclonic storm surges that may increase in severity due to climate change, then acting to threaten this vital coastal defense is perhaps a more dangerous hypocrisy. These activists, in turn, are relatively silent on the topic of climate change itself, suggesting that other local issues are more pressing.

[4] In this sense, the dissertation draws on a long history in agrarian studies of insisting that history *matters* (Wolford, 2007; Akram-Lodhi, Borras and Kay, 2006).

There is a Bengali idiom, শাক দিয়ে মাছ ঢাকা, meaning "covering up the fish with greens," used to indicate trying to hide something that is already well known to many. It might be used to describe the common attitude toward climate change discourse in Bangladesh. While climate denialism is rare, and few would disagree that the countries of the global north should take responsibility for mitigating the emissions of greenhouse gasses responsible, there remains in general, if not often publicly articulated, skepticism about the ways in which climate change is invoked. Climate change is largely considered to be the purview of "NGOs," a term literally referring to registered non-governmental organizations, but more generally inferring Bangladesh's massive development sector supported through international aid from the global north. Thus, there is a sense that the idea of climate change is deployed in ways that conceal the politics of environmental change that transpire locally.

Rising soil salinity in the southwest is a case in point of this skepticism about the drivers of change. Though it is commonly attributed to climate change in public discourse, most everyone would instead attribute it to a variety of other well-known changes in the landscape -- the construction of embankments, the diversion of much of the water of the Ganga river back to India through the Farakka Barrage,[5] and the cultivation of shrimp. The point here is not to argue that climate change will not impact coastal Bangladesh, but highlight the dynamics of contestation of knowledge production about how it will be experienced and its relationship to other drivers of environmental change. Specifically, this constant production of knowledge about climate change is fraught with power dynamics that silence alternative understandings of the history and politics of environmental changes in the region. It also illuminates how the power to frame dynamics of ecological change continues to shape the landscape now and into the future.

[5] In 1972, the Indian government unilaterally opened this barrage roughly 10 miles upstream from the Bangladesh border. Though the impacts of this barrage have been much-debated, it has been linked with serious ecological impacts in Bangladesh, particularly in Khulna (Adnan, 2009; Brown and Nicholls, 2015).

Political Ecologies of the Future: On the politics of prefiguration

"Who has the power to make places of spaces? Who contests this? What is at stake?" (Gupta and Ferguson 1997)

Ideas about the future actively shape the politics of the present. Who gets to imagine what the future will look like? What are the material implications of those imaginations? How do certain imaginations of the future become reality, while others are silenced and foreclosed? How is the power to determine the future exercised? These questions about the politics of prefiguration have perhaps never been as salient as in the time of climate change. Many facets of climate change response build on well-worn modernist teleologies of development and growth, yet, in its profound and expansive implications, climate change has also brought about unprecedented declarations of the end of history (Segal 2017; Castree 2015; Lipschutz 2017). Climate change, it is said, "changes everything" (Klein 2014). The sense that climate change creates imperatives unprecedented in human history leads to claims to similarly inexorable responses and inevitable futures.

What this dissertation demonstrates is that, even as the social and ecological threats posed by climate change may be unprecedented, far from being inevitable, their impacts are being actively shaped in the present. Climate change adaptation involves a normative process of imagining what the future will look like, and then working towards that vision, given particular constraints (Paprocki and Huq 2017). The power to determine those visions of the future is shaped by historical power dynamics and inequalities that far pre-date climate change. This prefiguration enlists and contributes to a "common sense" about what climate change is and the exercises of power that it necessitates (Gramsci 1971).[6]

[6] Watts makes a related point about notions of "resilience" as a "theory of just about everything" (Watts, 2015, p. 289).

I am interested broadly in the process of diagnosing dystopia. Who is the subject of this power of diagnosis and who is its object? How is that power secured and exercised? What is the relationship between a diagnosis of future dystopia and the present? How does the former shape the latter? Throughout the dissertation, I refer to "dystopic imaginaries" of climate change in Bangladesh, examining how they are formed and the kind of political work they do. A dystopia is a space where everything is bad or unpleasant; it evokes ruination, degradation, and deprivation. It also bears some relation to utopia; even as the two may be seen as obverse to one another, attempts to secure utopian visions may unwittingly have dystopic consequences, and one person's utopia may be another person's dystopia (Claeys 2017). Similar concerns are echoed in other scholarly works on apocalyptic climate imaginaries (Skrimshire 2010; Swyndgedouw 2010; Katz 1995; Ginn 2015). Yet, unlike apocalypse, which represents a sudden rupture or break with the present, a dystopia grows out of existing social, political and environmental realities. Apocalypse is necessarily fictional – it does not exist, this is not necessarily true of dystopia (Levitas 2010).

Imagination is also a powerful political force. It is a social practice and a means of world making. Imaginaries are not only figments, but they are both the product of and can have real, material effects. Imaginaries "build on the world as it is, but they also project futures as they ought to be" (Jasanoff 2015, 323). In this sense, they are deeply normative – the power of imagination is linked with the politics of prefiguration. If material and intellectual power dialectically reinforce one another (Marx and Engels 1998 [1846]), then the power of imagination fortifies the power to produce the future as it is imagined. A dystopic imaginary in the time of climate change is thus incredibly political potent. It reflects the actually existing material realities of social and environmental dispossession, while it also prophecies a catastrophic future collapse. This temporal ambiguity reflects a broader sense that elements of this dystopia may already exist. In its normative dimensions, a dystopic imaginary also projects an ideal alternative future. As it becomes

increasingly embedded into actually existing social and material worlds, it actively shapes them. Today, this power of prefiguration in Bangladesh has coalesced into what I call an *adaptation regime,* which I describe in greater detail below. The adaptation regime shapes ideas about the kinds of presents and futures that are seen as viable in the time of climate change. In many ways, it exacerbates the threats to which it claims to respond. Dystopic visions of a climate changed future produced by this regime have radical implications for people who are seen as under threat. For people in rural Bangladesh, that means dispossession from communities and livelihoods that are already vulnerable.

Figure 1. Farmer holding shrimp in Khulna

Bangladesh as "ground zero"

The role of Bangladesh as "ground zero" of climate change adaptation grew out of its status as "ground zero" of development - that is, of what Gillian Hart calls "big D" Development, a project of intervention in the "third world" emerging during the Cold War (Hart 2001). The centering of Bangladesh as ground zero was contingent on two dynamics: first, enframing Bangladesh as perpetual "basket case" (Mitchell 1988), and second, establishing it as a laboratory for development practice and research. As I explore further in Chapter 2, these processes continue to shape the work of development in Bangladesh and are the foundation of the adaptation regime.

Development Regimes in Bangladesh

The history of Bangladesh itself has progressed alongside the growth of global development imaginaries and regimes. In the aftermath of the brutal war of independence from Pakistan in 1971, unprecedented amounts of foreign aid poured into the country to finance reconstruction; by 1979 these aid flows were equivalent to 20% of Bangladesh's gross national product (Hartmann and Boyce 1983, 268). This aid has not come without conditions, however. As Rehman Sobhan argues, it produced a belief among major donors that "the size and importance of their contribution to Bangladesh's development effort [gave] them a right to dictate how it should conduct its development affairs" (Sobhan 1982, 146). The country's first administration, led by Sheikh Mujibur Rahman, had an uneasy relationship with foreign donors, owing largely to the latter's Cold War antipathy to the new government's avowed socialism (Sobhan 1982; Lewis 2011). Shortly after gaining independence, Bangladesh was infamously referred to by an American diplomat as a "basket case," a characterization which has haunted the country ever since. [7] After

[7] The "basket case" comment has regularly been attributed to Kissinger, although Lewis instead credits Ural Alexis Johnson, then a U.S. under-secretary of state for political affairs (Lewis 2011; White 1999).

Sheikh Mujib's assassination in 1975, these tensions cooled (even if the external cynicism directed toward the country did not) as the military government of General Ziaur Rahman worked closely with the World Bank (as the leader of a consortium of major foreign donors) to implement far-reaching market-led reforms, including trade liberalization, denationalization of the jute and textile industries, devaluation, monetary stabilization, establishment of early export processing zones, and reduction of subsidies by raising prices of public goods (Sobhan 1982; Uddin 2005; Muhammad 2006; Van Schendel 2009). The World Bank (along with other foreign donors) continues to exert a strong influence over Bangladesh's national budget and policy making (Byron 2015). The results of these reforms have been extraordinary; in 2014 the Pew Research Center called Bangladesh the second most pro-market friendly country in the world, while Forbes magazine dubbed it a "capitalist haven" (Dhaka Tribune 2014).

Many scholars have noted that Bangladesh's capitulation to these reforms reflected not only a transformation in economic policy and resource flows, but also a surrender of considerable sovereignty over both domestic and international policy in exchange for ongoing aid commitments (Muhammad 2006; Lewis 2011). This capitulation has been bolstered by an expanding urban elite whose class interests have become bound up with the interests of foreign donors (Sobhan 1982, 200). As David Lewis has written, "the content and representation of Bangladesh's economy and society had now become absorbed within the international project of developmentalism… [Today, aid] remains a powerful influence at the level of ideas and policy" (Lewis 2011, 39). Thus, early skepticism (if not contempt) of Bangladesh's right to self-determination[8] was quickly succeeded by the hegemony of a development regime firmly rooted in the nascent neoliberal development

[8] A transcript of a 1971 phone call between Nixon and Kissinger highlights these tensions. Following the receipt of a telegram from the US Embassy in Dhaka titled "Selective Genocide," concerning violence against Bengali civilians by the Pakistani military, Nixon expressed his support for General Yahya Khan, the President of Pakistan, noting that "The real question is whether anybody can run the god-damn place," to which Kissinger responded "That's right and of course the Bengalis have been extremely difficult to govern throughout their history" (Blood, Nixon and Kissinger, 2013:243).

model. The significance of this developmentalism extended beyond the Bangladeshi state, as the country became a global "test case of development," in the words of two former World Bank economists (Faaland and Parkinson 1976).

This hegemony coincided with the emergence of one of the most robust local development industries in the world (Lewis 2011). The model of neoliberal development was propagated largely through an NGO sector that grew rapidly (Devine 2003); today NGOs have a presence in at least 90% of Bangladeshi villages (Siddiquee and Faroqi 2016). As these NGOs increasingly took responsibility for social welfare activities, such as education, health care, and the provision of drinking water, the provision of entitlements that were formerly considered the purview of the state were increasingly privatized (Feldman 1997; White 1999). The rise of Bangladesh's NGO sector was linked with the country's expansive capitalist market reforms. Collectively, they have provided fertile ground for the emergence of the adaptation regime.

From Basket Case to Development Laboratory

The role of Bangladesh in the climate change adaptation regime is only the most recent phase in a long pattern of such experimentation. Though experiments in social and ecological engineering existed during the British colonial period, the first official use of Bangladesh as a development "laboratory" was through the Pakistan Academy for Rural Development (PARD, reborn after independence as BARD, or the Bangladesh Academy for Rural Development) (Ali 2013). In 1959, PARD was founded through support from USAID, the Ford Foundation, and Ayub Khan's military regime. Its centerpiece was a "social laboratory" established in Kothwali Thana,[9] an administrative unit of about 150,000 inhabitants in the Southeastern part of the country (Haque

[9] The word "thana" refers to a unit of police administration, which today are known as *upazilas* or sub-districts.

1977). PARD produced a rural development paradigm that came to be known as the Comilla Model, and which was celebrated as a model to be replicated in rural communities throughout the "Third World" (Ruttan 1997). By 1977, the model had been used to implement rural development programs in 200 of Bangladesh's then 434 *thanas* (Khan 1979). PARD functioned both as a training facility for rural administrators in new technologies in agricultural development, as well as a living laboratory for experiments in "cooperative capitalism," involving the dissemination and intensification of green revolution technologies through multi-class cooperative organizations, credit provision, reproductive health care for population control, and other experiments in social engineering, as well as a variety of public works, including the construction of irrigation and drainage canals, and flood protection embankments (Anisuzzaman et al. 1986).

Following green revolution doctrine, the Comilla Model did not address itself directly to the problem of inequitable land tenure and agrarian production relations (Haque 1977). Embedded within an agrarian political economy that continued to exhibit an essentially feudal character, the benefits of the model consequently accrued to larger landholders, largely due to elite capture and disenfranchisement of the landless (Khan 1979). The program itself ultimately exacerbated rural inequality and dispossession, as land transfer from small to larger farmers grew within the cooperatives (Blair 1978; Haque 1977). In 1974, PARD's lionized founder and erstwhile figurehead Akhter Hameed Khan (who departed in 1971 when East Pakistan became Bangladesh) wrote "no more shall the people of Comilla be harassed by my antics, nor I be overwhelmed by their problems… I call myself an expert in failure" (Khan 1974).

Yet, despite its failures in reality, the Comilla Model was largely regarded as a success in global development circles (Ali 2013; Blair 1978). This sense of the model's success can be attributed largely to its ideological function in serving as a global platform for experimentation with new and mobile interventions by a growing development industry. PARD offered

development practitioners and the scientists who worked with them a platform for experimenting not only with a variety of development technologies, but also for exploring the possibility of a model for a suite of technologies that could be universally replicable. As one social scientist involved with PARD explained, "the contribution of these studies to sociology is that they utilize concepts and hypotheses that were developed in the United States in a new setting and test the universality of the existing findings. Their peculiar accomplishment is that they do this under severely adverse research conditions" (Choldin 1969, 490). East Pakistan (and later Bangladesh) provided the perfect platform for such a laboratory because of its status of severe impoverishment, as well as supposed lack of governing capacity, suggesting its need for external intervention. Choldin's study highlights the importance of PARD in demonstrating not only the utility of green revolution technologies, but also their significance in establishing the importance of developing "social laboratories" for conducting experiments in rural development (Choldin 1969).

In the 1980s, Bangladesh was at the front line of population control efforts, as neo-Malthusian discourses of resource scarcity and overpopulation framed a new generation of development programs. With support from the Ford Foundation, USAID, the World Bank, and other bi- and multi-lateral donors, clinical trials and other experiments with Norplant, IUDs, and tubal ligation were carried out under the auspices of development programs (Hartmann 1995; Hardee, Balogh, and Villinski 1997). In 1981, Bangladesh received the largest total and largest per capita amount of funding for population control of any country in the world, almost ten times more per capita than neighboring India (Herz 1984, 19). While these programs facilitated access to some reproductive healthcare for poor women, they were also plagued by reports of failure to obtain consent from trial participants and forced sterilization (Hartmann 1995; Hardee, Balogh, and Villinski 1997).

By the early 2000s, Bangladesh was again in the spotlight of global development imaginaries because of? the burgeoning microcredit industry. Microcredit programs, and the development and research agencies that promoted them, promised an "end to poverty" through small loans to rural women (Yunus 1999). Over 60 percent of rural households are members of microfinance agencies, which by 2008 claimed some 10 million members and an annual loan disbursement of US$1.8 billion (Khandker, Koolwal, and Badruddoza 2013). The proliferation of microcredit programs brought Bangladesh worldwide attention as a global model for this new development "panacea" when Mohammad Yunus (and the Grameen Bank that he founded) won the 2006 Nobel Peace Prize. Critics of microcredit, however, pointed out that despite unrestrained enthusiasm (even "evangelism") for this new model for rural development, little evidence existed to suggest that it had any real impact on the reduction of poverty (Rogaly 1996; Duflo et al. 2013). Moreover, several studies have found that microcredit is implicated in the social and cultural alienation of women, exacerbation of indebtedness, and other forms of rural dispossession (Cons and Paprocki 2010; Karim 2011; Paprocki 2016).

As these examples illustrate, in its short history, Bangladesh is and has been a key site in the global development project, a geography of imagination and experimentation with new frontiers in "big D" Development. It is in this context that the emergence of the adaptation regime in Bangladesh must be examined, both in order to understand the role Bangladesh has played in its emergence, as well as in better understanding the regime itself. The role of Bangladesh at the forefront of climate change adaptation highlights the deep imbrication of the development project in the emergence of the adaptation regime.

Adaptation Regime

Today, the centrality of Bangladesh in the global development project is increasingly defined by and through what I call an *adaptation regime*, a socially and historically specific configuration of power that governs the landscape of possible intervention in the face of climate change.[10] The adaptation regime operates through three interrelated processes: imagination, experimentation, and dispossession. Each of these processes is produced and manifested both materially and epistemically. *Imagination* refers to the work of enframing Bangladesh as a space of climate crisis (Mitchell 1988), such that its social and ecological conditions can only be understood in relation to the impacts of climate change, and the vision of future habitation of the region is similarly delimited by this sense of impending crisis. This work of imagination is amplified through a process of *experimentation* with development interventions which are considered suitable for producing livelihoods appropriate to this changing climate. These interventions, referred to as climate change adaptation, produce agrarian *dispossession* by shaping and disciplining the possible production strategies of the region's inhabitants. This dispossession is lauded as an opportunity for development and growth, owing to its contributions to the production of urban export commodities. It is bolstered by the sense of its inevitability of climate crisis. Each of these dynamics of imagination, experimentation, and dispossession is produced through and in conversation with existing development regimes in Bangladesh. Critically, these dynamics also characterize the development regimes which have shaped this region historically.

The adaptation regime itself does not have agency, rather it is an agglomeration of actors (including donors, development practitioners, policy makers, researchers, and journalists) who do

[10] I am concerned here with the adaptation regime in its historical and geographical specificity in Bangladesh. This analytical lens is at once deeply localized and profoundly transnational, as the adaptation regime both shapes and is shaped by a global geopolitics of capitalist development. In this sense, it is grounded in a methodological tradition which recognizes the need to construct an understanding of global phenomena through attention to historically and geographically specific social processes (McMichael 1990; Hart 2002; Akhter 2015). While the adaptation regime nevertheless involves a variety of global actors and sites of production, it is beyond the scope of this dissertation to examine the global totality of its local manifestations.

exercise agency within their own spheres (sometimes in parallel but often in active coordination with one another). These discrete actions do not necessarily produce a coherent trajectory, yet in aggregate, they do have real, intelligible effects. Therefore, in describing this regime, I do not intend to invoke a unitary "thing," rather an interconnected set of relationships that take form in a particular way in this unique historical moment in Bangladesh. As such, descriptions herein of the acts of the adaptation regime refer not to the regime itself as an actor, but to the aggregate effects of the actors composing it.

Institutions of development, research, media, and science, as well as various state actors both nationally and internationally all participate in the adaptation regime. These actors both possess and endow the regime with authority. They legitimate this authority through their appeals to both scientific knowledge about ongoing changes in the region as well as their uncertainty concerning the future implications of climate change (Watts 2015). As such, the authority of the adaptation regime is paradoxically grounded in both knowledge and uncertainty about the present and future. Yet, to be clear, the adaptation regime also contains multiple perspectives and sometimes contradictions. "Regime" does not denote a single or totalizing authority. Rather, the adaptation regime evolves through the agency and interaction of multiply-situated actors who collectively shape and enforce its mode of governing.

The adaptation regime concept builds on political economies of development which theorize development regimes as intrinsically global in their material and ideological power, yet both administered and officially recognized in their national manifestations and particularities (Friedmann and McMichael 1989; Ludden 2005; Gellert 2010; Akhter 2015; Goldman 2005). While Bangladesh's adaptation regime is historically produced and concrete (as I examine below), it has been produced relationally within a global hierarchy of development and accumulation within and between nation-states (Hart 2001). I examine both global processes and local

specificities to illuminate the multiple scales through which production and social reproduction are managed and governed in the name of adaptation (Orlove 2009; Watts 2015).

Bangladesh's contemporary adaptation regime is at once a continuation of and a rupture with past development regimes (Ludden 2005). In many ways adaptation programs have resulted in the same material impacts, particularly, agrarian dispossession, of previous development regimes and have reinforced their long-standing logics and processes (Ireland and McKinnon 2013). Yet, the adaptation regime also represents a shift to a new regime of dispossession (Levien 2013) in the sense that it creates new opportunities for dispossession, legitimizes this dispossession differently and more urgently, and it thus (in its claims to inevitability) poses new challenges to resistance. I explore this process of dispossession both in its imbrication with prior development models and in its novel formations. The interface of development and climate change has also produced new understandings and discourses about the landscape, how it is changing, and what must be done to respond. Many development practitioners suggest that climate change presents a break with previous strategies and logics of development, in the sense that it produces new imperatives for transformation. If the impacts of climate change are inevitable, then the mandate to "adapt" is also inexorable.

In theorizing adaptation regimes, I build on critical scholarship from political ecology and environmental studies concerning the new opportunities and risks associated with discourses and interventions responding to climate change (Adger et al. 2001; Watts 2011; Marino and Ribot 2012; Barnes and Dove 2015; Watts 2015). Science and technology studies provides the tools for understanding the construction of knowledge associated with such practices, producing new sociotechnical imaginaries of life in a climate changed world (Demeritt 2001; Miller and Edwards 2001; Miller 2004; Jasanoff and Kim 2015). These new interventions conducted in the name of adaptation are embedded in long histories of development, understood as a conceptual apparatus

for ordering global hierarchies of wealth and power (Ferguson 1990; Hart 2001; Li 2007; McMichael 2009). Finally, the tools of agrarian studies, which questions teleological predictions of the disappearance of the peasantry (McMichael 2008; Akram-Lodhi and Kay 2009; Wolford 2010), facilitate an exploration of what we might call the agrarian question of climate change. That is, I examine the kinds of agrarian transitions that will result from climate change, or from attempts to adapt to it – questions that have been debated since Kautsky's foundational text (Kautsky 1988 [1899]).

Methods

To carry out this study, I conducted two years of multi-sited ethnographic research, building on work I have been doing in Khulna since 2012. I use this multi-sited approach across multiple nodes and geographic scales in order to connect how they fit together, and also to understand how power operates within and between them. My research led me from Khulna to Dhaka and Kolkata, and beyond to international conferences in Europe and other parts of Asia, as well as to historical archives on three different continents.

For over a decade, I have worked with a landless peasant movement in Bangladesh called Nijera Kori (NK), which means "we do it ourselves" in Bengali. Through my ongoing relationship with them, I became interested in studying the expansion of commercial shrimp aquaculture through development programs in the coastal region, which the movement has actively opposed for the past 20-30 years. Thus, I began my work in this region as a study of the agrarian political economy of shrimp cultivation. Through several years of pre-dissertation research, it became clear that today this expansion is intimately tied up with climate change adaptation and discourse. I heard repeatedly from development practitioners working in Khulna that shrimp farming should be

considered a climate change adaptations strategy, and that it was the only viable production strategy for the region.

My focus on the study of the politics of climate change refracted through these experiences working with a social movement that does not expressly address itself to climate change has had significant implications for how I understand climate justice. This absence of climate justice discourse in the movement's own narratives orient me toward a more critical and generative analysis of what climate justice does or could mean in this context. I read actually existing "climate justice" discourse against the grain by unpacking the common sense of those claims that are made for current understandings of climate justice while also suggesting the possibility of a vision for climate justice in political movements that do not currently claim it. To that end, this work is in dialogue with other current ethnographies concerned with climate justice that focus on social movements that do not expressly concern themselves with climate change (Koslov 2016; Cohen 2016). Collectively, these approaches suggest new ways to open up our understanding of what climate justice could look like.

In Dhaka, I conducted interviews and participant observation with donors, development practitioners, government officials and scientists. In Figure 2, I enumerate the types of agencies from which I interviewed respondents, most of which included multiple interviews with different staff members, often on multiple occasions. I selected respondents for interviews by identifying key decision makers in major development programs in every major aid agency working in Khulna and Bangladesh government agencies concerned with development planning in Khulna. I developed initial contacts through a combination of targeted emails to those I had identified as leaders in principal positions in these organizations, and also by introducing myself to people at conferences and other events where this community of decision makers gathers. I subsequently expanded this network through a snowball sample to other relevant agencies and practitioners

within them. I sometimes found while interviewing someone that they had heard about me from other practitioners without my prior knowledge, and that they had speculated about my analysis based on the questions I asked. This usually involved concern about potential criticism of their work, about logics of climate change adaptation, and about shrimp aquaculture. Their speculation made it all the more important to accurately and adequately represent my research, which I usually did by describing it succinctly as a study of the politics of climate change and specifically the use of shrimp farming as a climate change adaptation strategy.

Type of agency	NGOs	Donors/Embassies	UN agencies	Research organizations/ Universities	Activists	Government Agencies
Number of agencies	20	16	4	23	12	8

Figure 2. Table representing the agencies from which (often multiple) respondents were interviewed

The leader of one major aid agency, after sharing an internal report with me that was not ready for public dissemination (to which I had responded "Thanks for sharing! Very excited to read it."), wrote to me in an email "Don't get too carried away! 😀." About a year later, I ran into this official while interviewing another staff member at his organization, and he invited me into his office for another chat. He wanted to update me about how the project was developing and to hear about how my research was going. He told me that he knew my research had two facets – that it was both about the environmental problems being experience in Khulna, and about the people and processes involved in planning responses to them. While I never attempted to hide the focus of my research, it seemed that he had come to this conclusion after both reflecting on the questions I had asked him previously, and through conversations with other practitioners about questions I had asked them. I told him that this was true, and that I hoped he wasn't uncomfortable with it, to which he responded that he hoped I would be "charitable" to his agency in my analysis.

These exchanges reflect the general tenor of my interactions with development practitioners – they were frequently very forthcoming with me about their work and often generous

about sharing information, but with varying degrees of caution, apparently owing to their feelings of the sensitivity of the subjects under discussion. Climate change and shrimp aquaculture are two particularly sensitive[11] subjects among development practitioners in Bangladesh, at once ubiquitous and contentious, and both embedded in a variety of broader power dynamics related to the production of knowledge about development and environmental change (these concerns are explored further in Chapter 4).

One way in which this sensitivity was manifested in my fieldwork was in relation to my requests to record interviews. I had originally planned to use a cell phone or small digital audio recorder to record and subsequently transcribe all of my interviews. In the first few months I had some success with this, however I also had experiences in which interlocutors denied my requests to record our conversations, and found that sometimes just the request to do so made them uncomfortable, and changed the tone of the conversation. Responding to my recording request, one administrator laughed nervously, "well, now I need to be careful about what I say to you…" In another interview, a practitioner handed me a report that he said could be downloaded online; I asked to take a picture of it, he agreed, and when I lifted the cell phone camera to do so, he abruptly ducked, swatting at the device, apparently uneasy that I would take a photograph of him (he clarified this, embarrassed, once I set it down and apologized for unnerving him). I also found, however, that sometimes these same interlocutors would follow up my interviews with invitations to meet for lunch somewhere outside their offices, at their homes, or over a drink at one of the private clubs frequented by expatriates.[12] It became clear to me that most were much more

[11] This "sensitivity" reflects similar dynamics to those explored by Cons in his work on "sensitive space" (Cons, 2016).

[12] Without a membership of my own, I was able to enter most of these clubs only by being signed in by an existing member. These clubs, exclusive to foreign passport holders, are affiliated with foreign governments, and therefore allowed to sell alcohol, which is otherwise illegal in Bangladesh. They also feature restaurants, pools, tennis courts, and spas, and are therefore popular spots for socializing among Dhaka's expatriate community.

comfortable sharing information in a more casual context, and that this was impeded by my use of a recorder. They were also more likely, in these more casual contexts, to offer their reflections on the internal politics within and between the government and donor agencies, and their own critical perspectives on the work carried out by their own and other countries' agencies. I therefore decided for the most part to stop recording my interviews, and to rely instead on detailed notes during conversations, fleshed out afterwards in more detailed field notes. Thus, most included quotations reflect my best effort to capture people's exact words as they said them, subsequently copied into my field notes, though not excerpted directly from transcriptions. For the same reasons of this sensitivity, I have also attempted to protect the identity of my interlocutors when citing from private conversations.

The activity among these various actors in Dhaka is happening constantly, often meaning there are several events in a week where key actors are invited and relevant agencies are expected to be represented. An important part of this work of understanding this community, then, was to attend all of the relevant seminars and workshops, get to know all of the key players at different agencies and embassies, and to become immersed in the everyday practices of the community. To the extent that I was able, I attended these events regularly, in order to become part of the community myself and participate in its ongoing dialogues.

Becoming immersed in this community often posed methodological and ethical challenges related to working within communities holding often radically different political commitments and epistemological perspectives. Much of these challenges were related to the antagonistic relationship of activists and development actors, particularly in relation to conflicts over shrimp aquaculture. I was careful to disclose to development actors in Dhaka my ongoing work with activists in Khulna when it was relevant, while also not letting these relationships overdetermine the content of conversations with actors with other viewpoints. In Dhaka, I often found myself

enmeshed in conversations that produced precisely the dynamics I was studying. I was careful to ask questions in this area that were direct but did foreclose the possibility for practitioners to state viewpoints in support of shrimp. Examples of such questions included “I have heard about some of the negative social and ecological impacts of shrimp aquaculture and I have also heard from some practitioners that there may not be other options. What are your perspectives on this?;” “Is the threat of climate change changing agriculture and aquaculture development strategies in Bangladesh?;” and “How do you and your colleagues obtain scientific information about climate change and other ecological change in Bangladesh, and how does it inform your ideas about the kinds of agriculture and aquaculture strategies to pursue?”

A common event among development agencies is the "stakeholder workshop.” While this title might suggest the attendance of those rural community members who are the subjects (or objects) of development programs, the stakeholder workshop is instead an event to which development practitioners and government bureaucrats are invited. I was also frequently able to talk my way into invitations to such events. I was often very aware that my presence as a participant observer at these events may have been construed as consent to the program proposals under discussion. Attendees at these events are commonly offered an envelope of cash as a per diem or "conveyance" (theoretically a transportation stipend) in recognition of their attendance. I observed that these payments were sometimes as much as 5,000 Bangladeshi taka (or about US $75) amongst larger aid agencies. I made a personal policy of never accepting these cash payments as indication of my role of observation as opposed to consent.

I found these entanglements to be particularly challenging on a handful of occasions when I was offered the possibility of consulting contracts on projects related to aquaculture and climate change in Khulna. Because consultants engaged in these programs are often foreigners who have little to no experience in Bangladesh at all, I was told that my prior experience in Khulna,

relationships with local communities, and fluency in Bengali would be an uncommon asset to these programs. Even many Bangladeshi staff working in development agencies in Dhaka have little to no experience working directly in rural communities. While these opportunities would have provided me with unparalleled access to the inner-workings of such programs within development agencies, I ultimately turned them down to avoid any possibility of compromising my ability to conduct an independent analysis and to write freely about my findings.

My access to this community of practice concerned with climate change adaptation was expanded about nine months into my fieldwork when I was invited to become a Visiting Researcher at the International Centre for Climate Change and Development (ICCCAD) in Dhaka. ICCCAD's Director, Saleemul Huq, is a leader in global climate change policy and diplomacy networks. Because of the organization's leadership in these conversations within Bangladesh, ICCCAD is a key node in the adaptation regime. Dr. Huq regularly brought me with him to high-level seminars and meetings to which he was invited, and facilitated exceptional access to the inner-workings of these networks and conversations. My relationship with ICCCAD gave me new insight into the threats of climate change to Bangladesh, the international negotiations surrounding climate treaties, and claims related to climate justice. These insights also gave me new sympathy for the political claims made within these discourses, and helped me to reframe my analysis of how we should think about what climate change is and does (I expand on this more directly in the conclusion).

My research in Khulna built directly on relationships I developed and research I had conducted previously alongside NK. In 2012, I visited Khulna for the first time with Rezanur "Rose" Rahman, NK's Director of Research, and a longtime activist and community organizer with the organization. Rose has been a trusted colleague and interlocutor for over a decade, and I selected my research sites collaboratively with him. In 2013, I returned to these sites to conduct a study of

the agrarian political economy of shrimp aquaculture with my longtime collaborator Jason Cons and members of NK landless collectives (Paprocki and Cons 2014). To do this research, we used a participatory method we call Community Based Oral Testimony (CBOT), which we have used previously to study community perceptions of microcredit in northern Bangladesh (Cons and Paprocki 2010; Paprocki 2016). This study provided a robust foundation for my ethnographic study of related dynamics in Khulna, and it was a significant benefit to have already established relationships in each of these communities.

The three field sites in Khulna highlight how the impacts of environmental change are being experienced in different ways. I chose them because they have taken very different approaches to navigating ongoing transformations in the region, and because they illuminate different possibilities for ongoing rural livelihoods there. The first community is in Polder 23, which has almost entirely transitioned from rice agriculture to shrimp aquaculture (starting in the 1980s). Across the river, the community in Polder 22 has historically resisted the transition to shrimp largely through the mobilization of a landless social movement supported by NK. Farmers in the community in Polder 29 have transitioned from shrimp back to the earlier mode of agricultural production through this same social mobilization we see in Polder 29 (also through the support of organizers from NK). I regularly traveled between Khulna and Dhaka in order to continue ongoing work between these varied communities. In Khulna in particular, this approach had the benefit of allowing me to observe community dynamics through assorted growing seasons for shrimp, rice, and other agricultural crops.

While traveling around rural Khulna, I stayed at the remote field offices where NK staff live, and I frequently spent time with NK members and local leaders. On occasion, members of NK would ask to be interviewed within NK compounds, which are generally relatively private compared with even domestic spaces in rural communities (such as homes or gardens, where

Figure 3. Nijera Kori field office in Polder 22

neighbors will often wander into and crowd around conversations uninvited). However, I did not let NK staff accompany me while I was walking around the villages conducting interviews. This, I believe, allowed those community members who were not members of NK to more freely discuss their perspectives with me. Having already spent time in each of these villages the prior two summers, by the time I began dissertation fieldwork, most people had heard of my presence and my affiliation with the movement.[13] Yet, perhaps because of the significance (in different ways) of

[13] This was just one of many things I found that villagers had heard about me, others of which they usually seemed to find more curious, such as my habit of riding around on a bicycle, fondness for Bengali food, my absence of traditional gold jewelry (indicating, many often speculated, my father-in-law's disdain for me), and my failure to have children at a surprisingly advanced age despite having been married for several years. My openness about these kinds of personal details obviously endeared me to people there, helping me to develop relationships quickly with many different community members, and smoothing the way for me to ask my own personal and probing questions about their lives.

shrimp aquaculture in each of these communities, most were excited to relay their own perspectives and personal stories, regardless of the role of shrimp within them. Their awareness of my affiliation with NK, I believe, also led them to a desire to account more thoroughly for their motivations in participating in the shrimp boom, details that enriched and nuanced my research findings.

Figure 4. Nijera Kori field office in Polder 29

In Polder 23, I noticed that the out-migration of many community members meant that I was missing the perspective of a significant portion of the population. Since respondents there frequently told me stories of friends or family members who had migration to a particular slum on the outskirts of Kolkata, I began to solicit mobile phone numbers of these migrants with the intention of traveling to Kolkata to find and interview them. The vast majority of these phone numbers I gathered did not lead to viable interviews, both because of the pre-paid phone being out of service, and presumably also because of the discomfort of some people I was able to contact with being interviewed by an unknown stranger. I made a point of never soliciting information about these migrants' legal status in India, though presumably many if not all of them did not have legal authorization to work or reside there. Concerns about this legal status were presumably a concern for many of them about speaking with me, heightened by a growing xenophobic rhetoric in the midst of the 2014 Indian elections, during which then-candidate Narendra Modi remarked "You can write it down. After [the election on] May 16th, these Bangladeshis better be prepared with their bags packed" (Modi seething at Bangladeshi immigrants 2014). Two of the phone numbers that were shared with me in Polder 23 led to interviews with young men who had migrated from there, and these interviews led to a snowball sample of approximately 20 interviews with other migrants living in the same slum. I see this work as an extension of my research in the field site in Polder 23.

I also conducted research internationally at conferences on climate change and adaptation in Paris, Rotterdam, Kolkata and Kuala Lumpur. This research helped me to better situate the dynamics of the adaptation regime I was observing in Bangladesh within a broader global context, and to understand Bangladesh's role within this global regime. In Kolkata, this participation also led to opportunities to conduct interviews with Indian NGOs and government officials conducing work in the Sundarban mangrove forest on the opposite side of the border from Bangladesh. This

work extended my understanding of the cross-border environmental planning and interventions and their relationships to linked but distinct development regimes.

Finally, I conducted historical research in archives in Dhaka, Khulna, Kolkata, Delhi, London, Wageningen, Washington, DC, and outside Hamburg. This included government, NGO, and university archives, as well as the private collection of Gertrud and Helmut Denzau, a German couple who, as amateur naturalists with a passionate interest in the Sundarbans, have amassed what they (I believe rightly) consider to be the most comprehensive scholarly and historical archive in the region in the world in their home in a small village near the Baltic Sea. This research facilitated an understanding of the history of human intervention in this region, and how this intervention has shaped the current landscape and the vulnerability of communities inhabiting it.

Narratives

By working with each of these different sets of actors, I gained insight into how differently they understood the social and environmental challenges facing the region. These different understandings were manifested in different perceptions of the changes taking place, what those changes mean for the future of the region, and the normative value of those changes. These different perceptions also, importantly, were shaped by and had significant implications for material positions and actions among these various actors. Most significantly to understanding the adaptation regime, these competing interpretations of ongoing change shape the way the problem is addressed through climate change adaptation programs.

For example, when it comes to rural-out migration from Khulna, these different actors have dramatically different understandings of what is driving migration, and whether migration is a positive shift. In this case, for donors, development practitioners, and Bangladeshi government

agencies, the migrations taking place out of the coastal zone are thought of as 'climate migration,' and they are considered a positive opportunity for economic growth. For scientists, their perspective on migration is contingent on their research questions, which shape the way they approach the problem. Thus, researchers who set out to study climate migration may identify it in places where those who set out to study historical patterns of agrarian transition might not. Finally, for farmers and migrants in and from Khulna, the migrations taking place are largely the result of changes in agrarian political economy. That is, local residents see the transition from rice to shrimp as a driver of economic and ecological transformation that results in rural dispossession. They understand the changes their communities are experiencing not as sudden ruptures caused by climate change, but instead as the products of ongoing historical patterns of agrarian dispossession. Each of these groups interprets changes being observed through their own experiences, preoccupations, and normative frameworks. Migration is a pattern that is shaped by a variety of social and material dynamics, and thus is susceptible to being attributed to any of these diverse drivers. By untangling the different drivers of change that have led to the present conjuncture, we can not only better understand the complexity of how migration is shaped by social and environmental change in the current moment, but we can also better comprehend the political significance of these different interpretations of change.

Similarly, there is broad agreement that the region is facing significant environmental transformations, including rising soil salinity, intractable water logging, and declining diversity of indigenous species of plant and aquatic life. Yet, the causes of those changes are understood quite differently. Specifically, the role of climate change carries different weight in these different interpretations of socio-ecological change. Donors, development practitioners and government agencies again largely attribute these ongoing environmental changes to climate change. For scientists, their understandings of these changes are again largely shaped by the object of their

research, but for the most part they (particularly international natural scientists) believe that the current environmental changes are the result of a combination of factors, among which climate change plays a relatively minor role. Community members in Khulna attribute these changes directly to changes in rural production (specifically the transition from rice to shrimp), as well as the large-scale polder engineering projects over the past several decades.

Perhaps most importantly, these different actors hold very different perspectives on what these changes mean for the future. Donors, development practitioners, and most government agencies see the environmental crisis as inevitable, which motivates the idea that agriculture in Khulna is "no longer viable," or will no longer be viable in the near future. Clearly this sense of the inevitability of crisis has significant implications for the way that adaptation policy is designed and implemented. Scientists and farmers, however, largely see these changes in relation to particular historic and contemporary modes of planning and intervention (such as embankment engineering and aquaculture development programs). By identifying the ongoing formation and contestation of these plans and modes of intervention, scientists and residents of rural communities identify the active and ongoing production of these transformations, as opposed to their inevitability. This alternative interpretation of the inevitability of change suggests that with changes in current policy and modes of intervention, the dystopic future facing Khulna is avoidable.

Organization of the Dissertation

In its broadest sense, *Threatening Dystopias* is a dissertation about the politics of climate change and the possibility of agrarian livelihoods in a climate changed present and future. To that end, it examines the history, discourses, understandings of, and responses to ecological change in Bangladesh today. I approach this political ecology from a variety of different geographical and

historical perspectives in order to better understand the historical context of changes the country is currently experiencing.

Threatening Dystopias begins in chapter 1 with an exploration of the environmental history of the region that is now Khulna. Instead of tracing this history chronologically, I examine a select set of historical patterns of intervention and representation of the region, dating from the colonial period to the present. Tracing these dynamics over time demonstrates not only the persistence of historical patterns of development in the region, but also how this exercise of power has shaped the landscape and the vulnerability of its inhabitants to climate change today.

In chapter 2, I focus on the development politics of climate change adaptation interventions in Bangladesh. I do this by elaborating the concept of the *adaptation regime,* a socially and historically specific configuration of power that governs the landscape of possible intervention in the face of climate change. The chapter examines the political and historical dynamics through which Bangladesh has become "ground zero" for experiments in adaptation within the new global development regime under climate change. Chapter 3 extends this multi-scalar focus on development politics through an examination of imaginaries of the future under climate change. I argue that the imagination of future ruination under climate change is used to justify ruination in the present. I explore how this prefiguration transpires both in Khulna as well as through the process of development planning in the context of climate change. This chapter examines what I call *anticipatory ruination*, a discursive and material process of social and ecological destruction in anticipation of real or perceived threats. I use this concept to examine not only the dynamics taking place in Khulna, but also the ways in which climate crisis is constituted more broadly.

In chapter 4, I consider the politics of uncertainty embedded in the production of knowledge about climate change in Bangladesh. I argue that uncertainty about ecological change

and its drivers and impacts in the region is claimed, produced and mobilized to pursue particular ends within the adaptation regime. In so doing, I highlight the instability of the categories of certainty and uncertainty and how knowledge is enrolled in the production of each. Both are subject to interpretation and manipulation, and always in flux.

Chapters 5 and 6 bring into focus the agrarian political economy of three villages in Khulna. In chapter 5, I concentrate on a village that has transitioned entirely from rice agriculture to shrimp aquaculture, and the narratives of the residents of that village and migrants from it who have experienced that transition. I juxtapose these experiences with dominant narratives of climate migration to expose how visions of "developed futures" in the time of climate change both shape and are shaped by the production of knowledge about ongoing transformation in those communities. Chapter 6 offers an alternative vision of the future from two communities that have resisted the move to shrimp aquaculture. It examines the social mobilizations that have catalyzed this resistance, and the socio-political contexts within which they emerged. It concludes by discussing narratives of "incremental" and "transformational adaptation" that are pursued within the adaptation regime. In so doing it highlights the importance of examining these alternative visions from communities in Khulna to to think different about what "transformation" can look like and how it is pursued. Together, these two chapters outline competing visions for rural futures being imagined by rural communities in Khulna themselves.

In the conclusion, I advance a rubric for thinking about climate change as a biophysical process as well as a set of intentional social and political dynamics shaping life in the contemporary moment. Drawing on Gill Hart (2010), I propose that "big C"/"little c" C/climate change is a useful framework for understanding climate change not only as an immanent planetary shift, but also a social and political process that is in an ongoing state of production, transformation, and contestation in particular places. I sketch this new ontology for thinking about

what climate change is and does, proposing that we need to think differently about climate change in order to have a better understanding of how to develop strategies to live with it.

CHAPTER 1

"SLUTTISH, CARELESS, ROTTING ABUNDANCE:" PRE-HISTORIES OF A CLIMATE DYSTOPIA

"*[The Sunderbunds] are, in truth, a hideous belt of the most unpromising description, such as must cause any stranger wrecked on that coast, who should not proceed beyond the reach of the tide, to pronounce it a country fit for the residence of neither man nor beast*" (Gilchrist 1825, 446).

"*Man, in conjunction with the beasts of the field, the monsters of the deep, and the malaria of the forests, has assisted in rendering the Soonderbuns a place of bad repute*" (1859, 19).

Long before the adaptation regime secured Bangladesh's status on the map of global climate crisis, a dystopic imaginary of the region had already started forming during the colonial period. The region, particularly the Sundarban[14] forests contained within it, was an object of intense fascination, anxiety and denigration in the West.[15] Rudyard Kipling called it "unwholesome" (1922, 86) while Charles Dickens dubbed it "not healthy" (1875, 379). British Geographer James Rennell, who created what is considered the first relatively accurate map of the region[16] (see Figure 5) opined, "I have long since forgot myself so far as to imagine that this is no part of it (the world), but only a separate part of the universe" (cited in Barrow 2003, 44). Yet, in its very remote, wild, and dystopic qualities, it has been enlisted in a variety of ways as a flexible resource in a shifting global political economy. As I explore further below, this has taken the shape

[14] In the colonial record, the Sundarbans (সুন্দরবন in Bengali) were variably referred to as "Sunderbunds," "Sunderbans," "Soonderbans," etc. This variability is largely the result of an uncertain etymology, attributing the region's name in turns to the beauty of the forest, its proximity to the sea, the presence of embankments, and the abundance of sundori trees (a particularly valuable timber resource), among other theories. Unless quoting directly, I used "Sundarbans" to reflect the accepted current translation and transliteration.

[15] The contemporary district of Khulna in Southwestern Bangladesh (on which this study is focused) falls within the broader area historically referred to as the Sundarbans. The bounds of this region have shifted over time, both as a result of deforestation that expanded the area of human settlement, changing borders of districts and nation-states, and ongoing transformations in juridico-political regimes. Indeed, in 1927 the colonial Settlement Officer of Khulna wrote that "the revenue history of the area covered by Khulna district is almost entirely a history of Sunderban administration" (Fawcus, 1927, p.64). I thus take the historic region of The Sundarbans, however unstable, as a rough proxy for the region examined in this study more broadly.

[16] Supported by the East India Company, Major James Rennell carried out the first comprehensive survey of the Ganges, Meghna and Brahmaputra river systems in the late 18th century. His *Bengal Atlas* and accompanying *Memoir of a Map of Hindoostan* were essential texts employed in the British conquest and management of the subcontinent (Barrow 2003, Rennell 1781, Rennell 1788).

of both ideological and material resources, the value of which has shifted over time alongside regimes of governance. At the same time, the region's unique biophysical particularities have chronically impeded attempts to subdue it. By interrogating this contingent and particular production of nature across spatial and temporal scales, this historical accounting of the Sundarban region facilitates a better understanding of the ecological politics of the present (Hart 2002a; Smith 2008; Sivaramakrishnan 1999; Loftus 2013).

Figure 5. Rennell's map of Bengal and Bihar

The region's unique physical geography has contributed to this dystopic imaginary. The Ganges-Brahmaputra-Meghna (GBM) delta is the youngest, largest, and most active river delta in the world (Rahman, Chowdhury, and Ahmed 2003). This is manifested in the coastal floodplain area of Khulna by the presence of a dense network of river distributaries that are constantly moving, punctuated by land masses that are in a constant state of erosion and accretion (see Figure 26 and Chapter 4 for a further discussion of erosion) (Brammer 2014a; Allison et al. 2003). Thus, the borders of the coastline itself and the islands of which the coastal region is composed are naturally predisposed to shifting at a rate that can be observed on an annual basis.[17] This river

[17] Allison et al. cite a rate of avulsion of the major rivers in the region - meaning complete abandonment of one river channel and formation of another - at the timescale of a single century (Allison et al. 2003, 319).

movement (or avulsion) happens when the water flow migrates from one channel to another, thus changing the size of channels as the water volume shifts. As the rivers carry alluvial sediment (both transported from the Himalayas and gathered along the course of the rivers), this dynamic of river movement also involves the siltation of river beds, when sediments are deposited, causing them to narrow and reduce their depth (see Figure 14) (Rogers, Goodbred, and Mondal 2013; Pethick and Orford 2013). A related feature of the region's geomorphology is that the land is constantly subsiding, the result of both natural and anthropogenic factors (Brown and Nicholls 2015; Hanebuth et al. 2013).[18] This subsidence was observed during the colonial period, but has come under particular attention recently due to its significance in measuring rates of relative sea level rise in relation to climate change (Brown and Nicholls 2015; Pethick and Orford 2013). That is, relative sea level rise can be caused either by absolute changes in sea level (which is one result of anthropogenic global warming) or in the local vertical movement of land related to local and regional processes.

In this chapter, I trace the environmental history of the region that is now Khulna from the colonial period to the present. The boundaries of the region have shifted continually throughout this period, and the Khulna district itself was not officially demarcated until 1882 (Heinig 1892, E2). Thus, I focus here on the greater region of the Sundarbans, a mangrove forest that spans the border between what is today southwestern Bangladesh and the neighboring Indian state of West Bengal.[19] The map in Figure 6 indicates the boundaries of the Sundarbans in the Khulna region

[18] Though the interaction between natural and anthropogenic factors driving climate change is poorly understood, Brown and Nicholls have documented the its human influences in the GBM Delta, explaining that the most significant driver of anthropogenic subsidence in Khulna has been reduced sedimentation caused by protective embankments (2015). A thorough examination of anthropogenic drivers of subsidence in delta regions can be found in (Syvitski et al. 2009).

[19] In India, the dense mangrove forest along with the inhabited islands surrounding them are today collectively known as the Sundarbans, while in Bangladesh, this name is applied only to the areas of reserved forest. Thus, my use of this variable term is complicated by its unstable application across the border, while it is further complicated temporally by the deforestation of the mangroves throughout this time period (peaking during the colonial period). However, as the chapter will demonstrate, the discursive tropes

both inside and outside of the officially designated Protected Forest. I begin with the colonial period not to suggest that the political ecology of the region was not shaped in important ways prior to British intervention.[20] Indeed, according to the Bangladesh Bureau of Statistics, the area of Paikgachha was settled under Hazrat Khan Jahan Ali, a legendary 15th century Sufi saint and governor of what is now the Khulna region under the Bengal Sultanate (BBS 2012). The name Paikgachha is said to be a reference to a particular group of peasant-militias drafted into service for clearing the Sundarbans (the "paiks"), and the trees they were forced to clear to make way for cultivation ("gach"). My focus on the colonial period to the present illuminates two important continuities from the colonial period to the present: first, the persistence of distinctively colonial modes of representation in enframing this region today, and second, a colonial re-shaping of the agrarian political economy that "forced the local economy to adapt to the needs of the metropolis" (Van Schendel 1982, 274).[21] These epistemic and material dynamics both lay the foundation for and profoundly shape the current adaptation regime.

Tracing these dynamics of the contemporary dystopic climate imaginary back through the colonial period is analytically significant in two ways. The first is in illuminating a longer history of contemporary ways of seeing and intervening in the landscape. Current discourses surrounding Bangladesh's unique vulnerability to climate change are not new, but draw on historic tropes about the region's inherent biophysical vulnerability due to low elevation, geomorphological instability, cyclonic activity, and mangrove ecology. Moreover, tracing this history helps us to

---

and management practices applied to the region transcend the boundaries of the forest (however they are demarcated).

[20] See Sivaramakrishnan, 1999 for a critique of the preoccupation among postcolonial scholars with colonialism as a watershed in South Asian environmental history.

[21] Richard Eaton has examined precolonial jungle reclamation and the advance of the agrarian frontier in this region, particularly the role of Muslim holy men in the early Mughal period (1990, 1993). While the timeframe of early settlement in the region is the subject of much debate (Beveridge, 1876), some scholars have dated settlement in the Sundarbans region as far back as the Ramayana and Mahabharata religious texts around 3000 to 4000 BC (Chattopadhyaya, 1999, p.26).

understand that the current ecological crisis faced by the region has been profoundly shaped by these modes of intervening in and imagining the region. In particular, we can see that even in the face of dystopic imaginaries, attempts to transform the landscape to make it more governable and susceptible to profit extraction have themselves exacerbated this vulnerability. Indeed, the vulnerability of Southwestern Bangladesh to climate change is not an accident of geography; rather, it is the product of the imbrication of its particular local ecology with global circuits of capital and governance (Watts 2003; Hart 2002b). Examining this history is thus essential to understanding the political ecology of the adaptation regime.

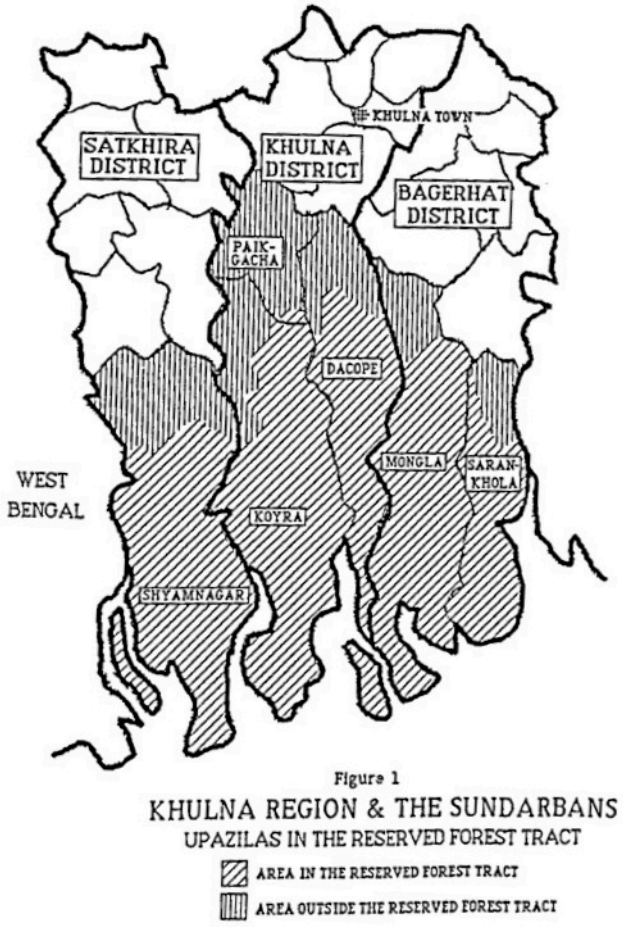

Figure 6. Map of Khulna and the Sundarbans, indicating areas in and outside officially Reserved Forest Tracts. Source: (Blair 1990)

In this chapter, I begin by contextualizing this history first in relation to current literature on genealogies of wasteland development narratives. I then examine the significance of the region to global circuits of capital and accumulation. Finally, I examine this history by tracing the dynamics of the adaptation regime (imagination, experimentation, and dispossession) from the colonial period to the present.

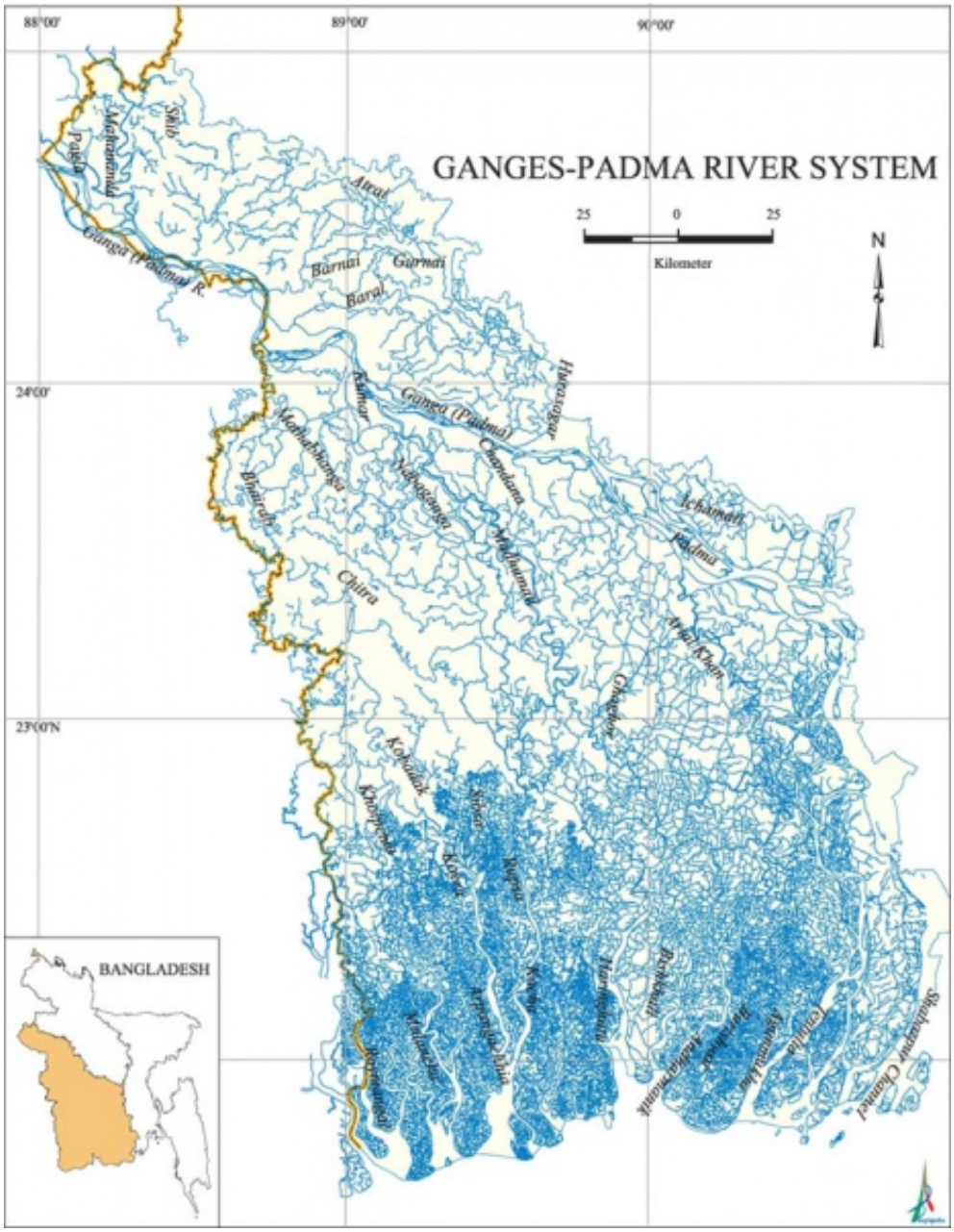

Figure 7. Map of the Ganges-Padma River System. Source: Banglapedia

Waste

In 1793, the East India Company introduced a new land revenue system in Bengal through the Act of Permanent Settlement. In exchange for the British renunciation of any future increase in land taxation, the Permanent Settlement granted permanent property rights to a select group of Bengali *zamindars* who committed to large, fixed cash payments to the Raj. These zamindars were in turn responsible for collecting rents directly from cultivators who worked in their estates, thus creating a new landlord class with almost absolute authority over the land and agrarian economy (Iqbal 2010; Marshall 1987). Significantly, the codification of these property rights also necessitated the designation of a category of "wastelands," which were not cultivated and therefore could not (yet) be subject to private taxation (Sivaramakrishnan 1999). Wastelands were not included in the Permanent Settlement, and were considered government property. The Sundarban region, covered with dense mangrove forest and largely uncultivated, was thus officially designated as "wasteland" as all of Bengal was being brought under a new regime of private property rights (Pargiter 1934).

However, the the Act of 1793 was passed with no land survey or method of assessment or recording of land rights (Ludden 2011). As these methods were developed over the remainder of the 18th and early 19th century, a new office of the Commissioner of the Sundarbans was established in 1816 (Beveridge 1876a).[22] This person's primary task was to promote land reclamation (explored in further detail below), in order to facilitate the expansion of cultivation, and thus turn "waste" into land that generated tax revenue (Sarkar 2010; Iqbal 2010). Administrators believed that the instigation of private property rights would create an incentive to

[22] This Commissioner of the Sundarbans existed until 1905, when the Sundarbans Act transferred the powers of the Commissioner to the Collectors of the three districts within which the forest was contained (Khulna, Backarganj, and the 24-Parganas) (Mandal, 2003). By this time the Sundarbans had been so comprehensively mapped and surveyed that the land administration was not so burdensome as to require its own administrator.

expand the areas under cultivation by motivating the improvement (meaning clearing and cultivation) of wastes (Guha 1982). As this cultivation expanded, new leases were granted, the revenues from which were managed by the Commissioner of the Sundarbans. The material and ideological conditions that gave rise to and resulted from this designation of the Sundarbans in particular are explored in further detail below.

For the British, land was technically considered waste if it did not generate tax revenue for the Raj (Ariza-Montobbio et al. 2010). Designation of wastelands facilitated enclosure (Goldstein 2012), rendering the land an object of "improvement" (Guha 1982). Yet, the category was applied to a wide variety of existing ecological and biophysical conditions and to areas with extremely heterogeneous existing uses (Singh 2012). Thus, the Sundarbans and other areas considered "jungle" (another heterogeneous category) were designated waste along with many common lands such as pasture within villages used for grazing cattle (Sivaramakrishnan 1999; de Hoop and Arora 2017). Determining a precise definition of "wasteland" is, however, confounded by the very mutability of its application (Baka 2013). Waste is a relational concept, constantly redefined alongside shifting development objectives and theories of value (Gidwani 2012; Baka 2016).

As Gidwani explains, the discursive construction of certain lands as "waste" did political and ideological work for the empire (Gidwani 1992). In addition to having a revenue imperative (leasing waste lands to be brought under cultivation generated increased revenues for the colonial state), it also facilitated the British justification for colonization by simultaneously emphasizing what they understood to be the cultural and physical inferiority of Indians to the British. The British thus encouraged the development of waste lands for cultivation, offering new opportunities for governance and accumulation (Greenough 1998; Guha 1990).[23] The categorization of waste thus

[23] Sivaramakrishnan explains that the establishment of the Bengal Wasteland Rules in 1853 served a variety of purposes for the colonial administration, not always directly related to the extraction of forest resources

laid the foundation for material interventions facilitating extraction and accumulation by the colonial state and private British investors and corporations (Isenberg 2016; Gidwani and Reddy 2011; Gidwani 2012; Baka 2013, 2016; Goldstein 2012). The government granted special leases to *zamindars* in order to facilitate cultivation, known as *patitabad*,[24] with sub-leases granted by the *zamindars* to cultivators (Mukherjee 1983; Pargiter 1934; Ludden 2011). The government itself retained the right to determine the land's potential for productivity. Figure 8 and Figure 9 feature maps of the areas categorized as "waste" in the Gangetic plain and land use and categorization throughout India, respectively.[25]

(1999, p.132). The present case of wasteland categorization supporting the reclamation of land for rice cultivation supports this analysis.

[24] The literal meaning of *patitabad* is "prostitution plantation," reflecting the sense of these waste lands as offering exceptional potential for exploitation. It also reflects the moral valence of "wasteland" classification, explored in more detail by Gidwani 1992 and Baka 2013.

[25] Note in these maps that by the 1930s, much of the Sundarbans had been designated as protected forest, a shift that is reflected in the lower percentages indicated of "culturable waste." Here, we find the result of heterogeneous and shifting definitions of "wasteland," as explored further below.

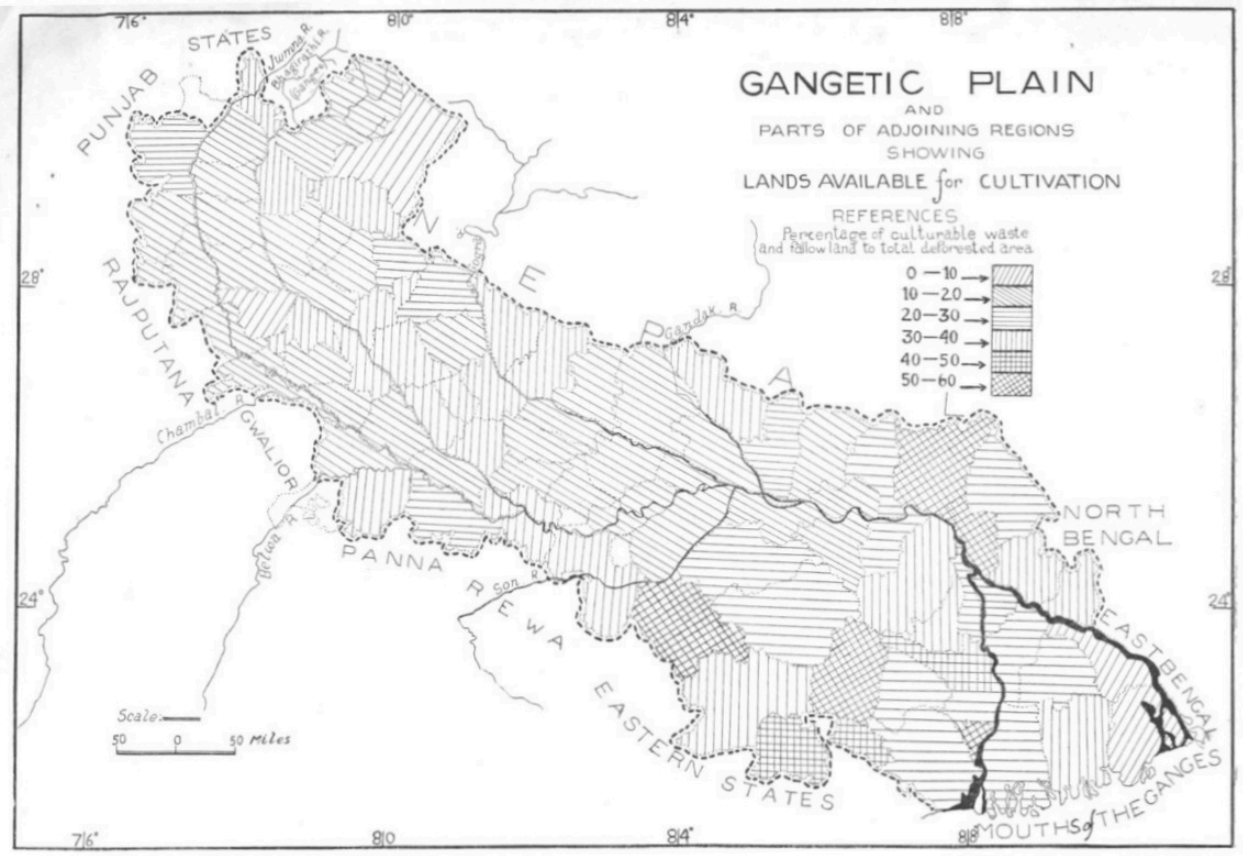

Figure 8. Map of "cultivable waste" in India in the 1930s. Source: (Chatterjee 1941)

The colonial imperative of expanded capitalist accumulation combined with its normative conceptions of the value of land (and the people and production relations inhabiting it) combined in wasteland development discourses as the foundation for governing both space and people in the Sundarban region, and continue to shape the way that the region is governed today.[26] Wasteland discourses have come under renewed scrutiny in recent years due to their revitalization within the rapid growth of large-scale land deals (the "global land grab") (Borras Jr and Franco 2012; White et al. 2012; Wolford et al. 2013). Much of this literature has examined the roots of current land grabbing dynamics in the colonial enclosure movement (White and Dasgupta 2010; Baka 2016). South Asian Historians have likewise recognized the significance of wasteland

[26] As a counterpoint, it is worth noting here that Historian PJ Marshall attributes the expansion of cultivation in the Sundarbans primarily to "climatic regularity rather than colonial rule" (Marshall, 1987, p.180).

development schemes and narratives in the British colonization of the subcontinent (Ludden 2011; Gilmartin 2003; Iqbal 2010).

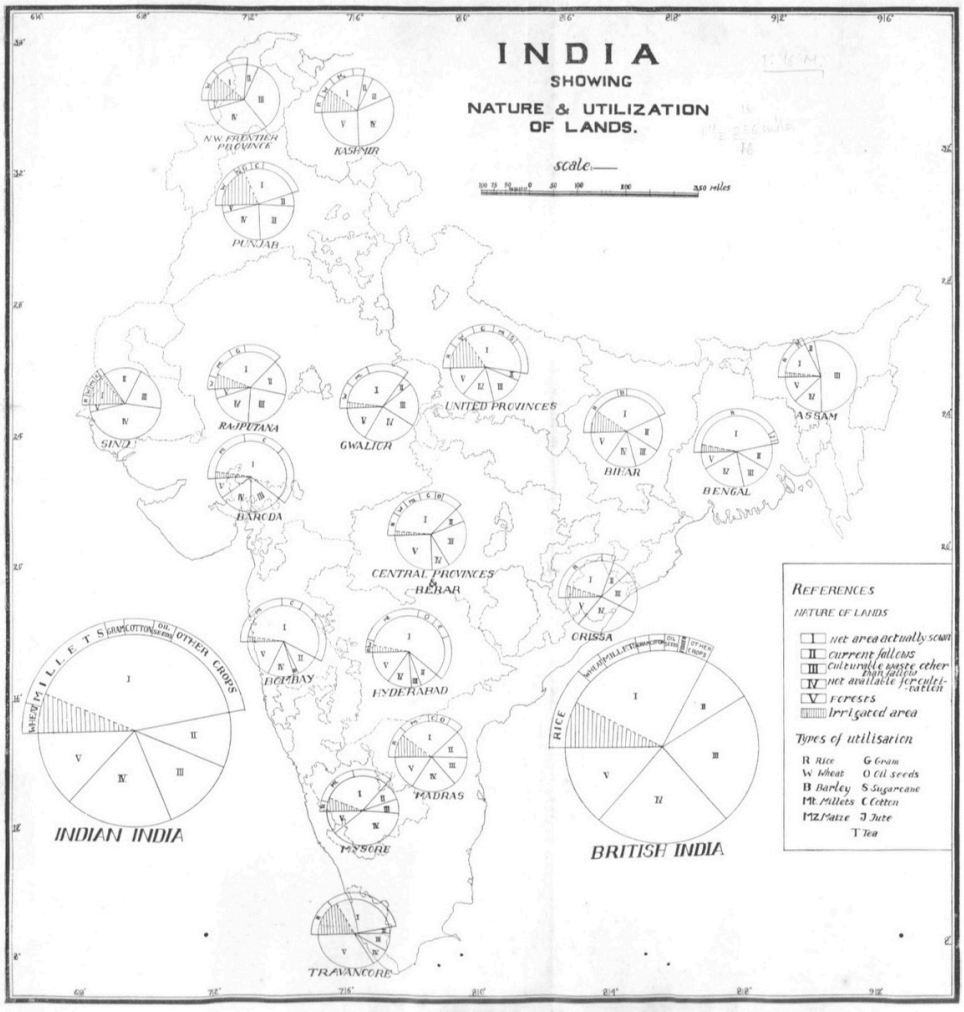

Figure 9. Map of land use and categorization in different regions India in the in 1930s. Source: (Chatterjee 1941)

In the Sundarban region, the extent and variety of these lands categorized as waste offered ample scope for colonial administrators to devise methods of scientifically, politically, and physically managing the landscape. As one administrator observed, "this wilderness and labyrinth of rivers is the property of no landholder, but of the [colonial] sovereign," and thus cultivation and extraction could be undertaken on the basis of this sovereignty over waste (Hamilton 1820, 126). In addition to being home to extensive forested areas (which made up the majority of wastelands throughout British India), the chars and diaras (alluvial sediment deposits that form gradually into

new land masses) were also classified as wasteland. Figure 10 depicts an example of the gradual formation of such alluvial land masses in the Sundarbans in the last several decades. The classification of the Sundarbans as waste was also claimed by colonial administrators as cause for excluding the region from the Permanent Settlement, thus establishing the government's indefinite right to the profits from all resources extracted from the area (Iqbal 2010; Pargiter 1934).

Figure 10. Example of char formation in the Sundarbans, images taken in 1985 and 2015. Source: Google Earth

Accumulation

If the Sundarbans have been framed in colonial and post-colonial imaginaries as wild and remote, their position in global political economies has been anything but marginal. Its unstable ecological and biophysical features have in many ways undermined attempts at governance and accumulation. As successive development regimes have sought greater control over the landscape, these environmental challenges have stoked dystopic imaginaries of the region

The British East India Company established its primary port and trading base in Kolkata (then Calcutta) in the late 17th century, and Kolkata subsequently became the capital of the British Raj. The Port of Calcutta became the most important port in British India, with all shipping traffic

routed through the Sundarbans (Hunter 1875b, 16),[27] leading one colonial observer to refer to the Sundarbans as "the British emporium of the East" (Bull 1823, 124). The growing significance of these shipping routes contributed to the importance of Calcutta as a commercial city and the power of the British political and economic control in India (Mukerjee 1938, 26). The 1908 Khulna Gazetteer referred to these shipping routes as "one of the most important systems of inland navigation in the world," with trafficked goods valued at nearly four million pounds sterling annually (O'Malley 1908, 128). The town of Khulna, located just north of the forested area of the Sundarbans, was an important node in this network, as the headquarters of the Salt Department under the East India Company and the "grand mart for all Sundarbans trade" (Hunter 1875a) well into the 20th century.

As British economic power expanded in the subcontinent, so did the size of their trading ships and the traffic through the Sundarbans. However, the constant movement of the rivers, shoals, and chars presented serious challenges to this ship traffic. In a series of six lectures delivered in Calcutta in 1906 entitled "Waterways in Bengal: Their Economic Value and the Methods Employed for Their Improvement," one government engineer complained of the large amount of money that British Steamer Companies were forced to write off every year due to shipwrecks in the Sundarban passages (Lees 1906, 26). This predicament led administrators on an unabating quest to discover ways to reshape and control the waterways. In fact, the initial objective of Rennell's surveys (which ultimately produced his Atlas of the delta) was to map the shipping routes to Calcutta in order to facilitate the movement of goods, more efficient revenue collection, as well as the transportation of troops to the capital (Rennell 1910; Barrow 2003). At a forum held by the Society of Arts in London, one British official appealed for greater efforts to

[27] Several of the field sites in which research for this study was conducted were bordered by the primary inland shipping route within this network, and Paikgachha itself became home to one of the most important weekly markets for trading Sundarban resources (Gastrula, 1868).

develop the Sundarbans passages following other major world economic powers, noting "America and Germany had utilized and improved their rivers, and made them capable of carrying an enormous quantity of goods at a very cheap freight, and the trade of those countries in consequence had prospered to an enviable degree" (Buckely 1906, 434). Thus, proposed remedies for challenges of navigation through the Sundarbans were abundant. As this same official explained, "a little deepening of the sand banks on the Ganges and the Brahmaputra would mean that all the steamers would be able to carry several hundred tons more than they would otherwise be able to do. What that would mean to the traffic of the country and to the rates charged was obvious" (Buckely 1906, 434). These proposals for re-engineering the landscape have been a recurring concern of subsequent development regimes in the region (United Nations Water Control Mission to Pakistan 1959; International Bank for Reconstruction and Development 1972c), and will be taken up further later in the chapter.

As the economic priorities of the region's development regimes shifted, so did the governance of the Sundarbans. In the late 19th century, colonial planners began to see the development of a railway network across the subcontinent as integral to the progress and expansion of the British empire. As Iftekhar Iqbal has explored in his environmental history of the Bengal delta, the rail network increasingly took priority over the navigability of the vast network of waterways (Iqbal 2010). In a pamphlet entitled "A Letter to the Shareholders of the East Indian Railway, and to the Commercial Capitalists of England and India," the author argued that expanding the rail network into the Ganges delta from Calcutta would be of "universal benefit" to Britain, as "Calcutta is your emporium" and "the Ganges Valley is your manufactory--your trading ground--your source of wealth" (Transit 1848). Thus, facilitating the extraction and transport of resources from the delta region was necessary to the expansion of the entire empire. As explored further below, the governance of forest resources in the Sundarbans also shifted as administrators

recognized that building this vast railway network would require a substantial amount of timber, and that the sundri mangroves were exceptionally suited for this, being used in construction of rail tracks (Buckland 1901; O'Malley 1908).

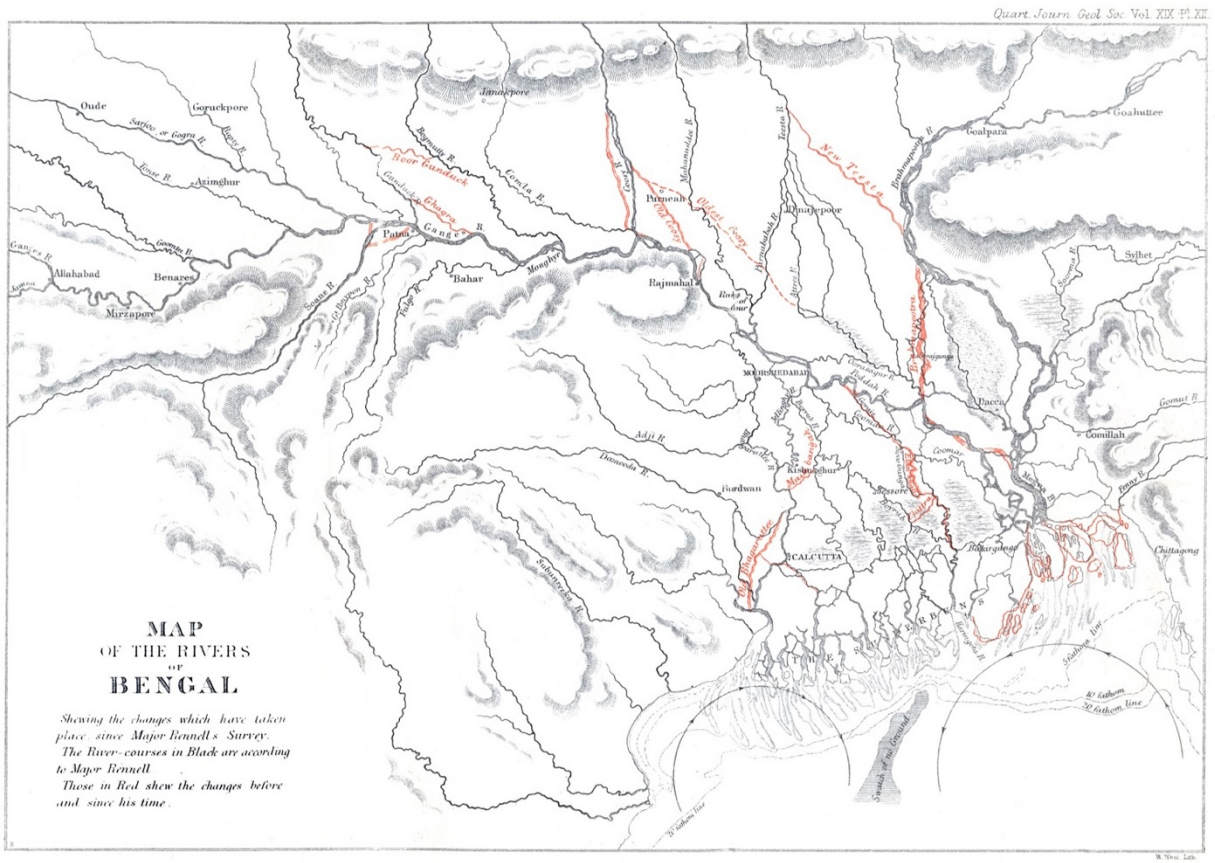

Figure 11. Map of changes in the course of rivers in the Bengal delta between Rennell's survey and 1863 (changes marked in red). Source: (Fergusson 1863)

After independence, Khulna continued to hold a significant place in the developmentalist imaginary for then-East Pakistan. The period following Partition between 1947 and 1971 was characterized by the political and economic colonization of East Pakistan by West Pakistan (Wood 1981; Van Schendel 2009; Feldman 1999). This took the shape of intensive resource extraction from the East by the West, along with the failure of the utopian promise of agrarian reform (Hashmi 1992; Blair 1978; Lewis 2011). East Pakistan systematically subsidized the industrial growth of West Pakistan, largely through the export of raw jute (a natural agricultural fiber used for

making rope and burlap) (Sobhan 1971, 1962). In spite of East Pakistan earning approximately 60-70% of the country's foreign exchange in the decade after Partition (Sobhan 1962, 37), it received only 20% of the country's development expenditure (Haq et al. 1976). While development investments were nationally concentrated in the growth of industrial manufacturing (Huq 1958), the largest investments in East Pakistan were made in water management infrastructures in Khulna (International Bank for Reconstruction and Development 1972b). These investments were justified on the basis of the Green Revolution goals of expanding the cropping area and growing yields in order to facilitate increased exports of raw agricultural resources (Warner 2008). The results of these interventions and infrastructural investments will be explored further below.

Although the priorities of these successive developments regimes can be understood in relation to economic priorities and potential for accumulation, they should also be understood in relation to broader concerns related to governance and state building. Since the colonial period, governance objectives in the region have integrated, on the one hand, resource exploitation and capitalist accumulation, and other priorities related to state territoriality and the production and maintenance of hegemonic legitimacy. Barrow argues that Rennell's Bengal atlas served this purpose of extending the legitimacy of British East India Company rule in Bengal (at a time when it was under threat and particularly weak), writing that Rennell "gave Company rule a colonial character, suggesting that the Company was interested in governance and improvement and not just in conquest" (Barrow 2003, 40). After Independence, aid flows were motivated heavily by the competing interests in the Cold War, each of which saw investments in development as vital in establishing ideological legitimacy in the region (Sobhan 1982; Van Schendel 2009); in particular, agencies from both the West and the Soviet Bloc invested heavily in water management infrastructure in the Southwest (Agency for International Development 1967).

Figure 12. Picture of Norman Borlaug, "father of the Green Revolution," in the entrance to the headquarters of the Bangladesh Agricultural Research Council

Temporariness

The impermanence of this landscape has consistently been among the greatest challenges to those seeking to govern it, a challenge which has characterized these successive development regimes. The temporary political geographies that have resulted have thus themselves been ephemeral and unstable. Recognizing this biophysical mutability and its relationship with the region's political mutability facilitates a better understanding of the dynamics that have given rise to the contemporary adaptation regime. Recognizing this temporariness, these dynamics are best understood through a "mosaic approach" to environmental history advocated by Sivaramakrishnan, that attends to the stochastic and disorganized nature of environmental change (Sivaramakrishnan 1999, 14).

The natural dynamics of river movement and deltaic transformation were a source of unremitting anxiety for colonial administrators. They questioned whether the land in the delta was stable enough to inhabit, or to accommodate the kinds of durable settlements they envisaged. One colonial administrator, chronicling the effects of these river movements on landholders, remarked "No buildings intended for duration can be raised on so unstable a foundation" (Hamilton 1828, 175). These questions about whether the land was fit for habitation resonate today with contemporary concerns about whether climate change will make coastal Bangladesh uninhabitable.

The British sought at length to understand and document the constantly shifting nature of the landscape, as well as to find scientific means to mitigate its transience. One former judge in the Calcutta High Court recalled,

> "I can state that, between the years 1842 and 1869 inclusive, or my period of active service in India, I never recollect a time in which some proposal or other was not under discussion, in the Press and in official correspondence, in regard to these rivers. There was, generally, a dread that this or that channel was silting up; and there were repeated proposals for dredging, improving, or widening the channels" (Seton-Karr 1899, 651).

In addition to these concerns about how to physically manage the river channels, colonial officials also deliberated extensively about how to manage the rights to alluvial accretions and their associated economic benefits. While the temporariness of the land threatened the stability of colonial accumulation, colonial administrators sought to manage the temporary geography of deltaic land masses by devising new means of legally recognizing the economic value of unexpected possibilities for accumulation. This was carried out through unique land tenure arrangements that temporarily suspended taxation to promote expanded cultivation, as well as physical interventions to reclaim land mass, both explored in greater detail below.

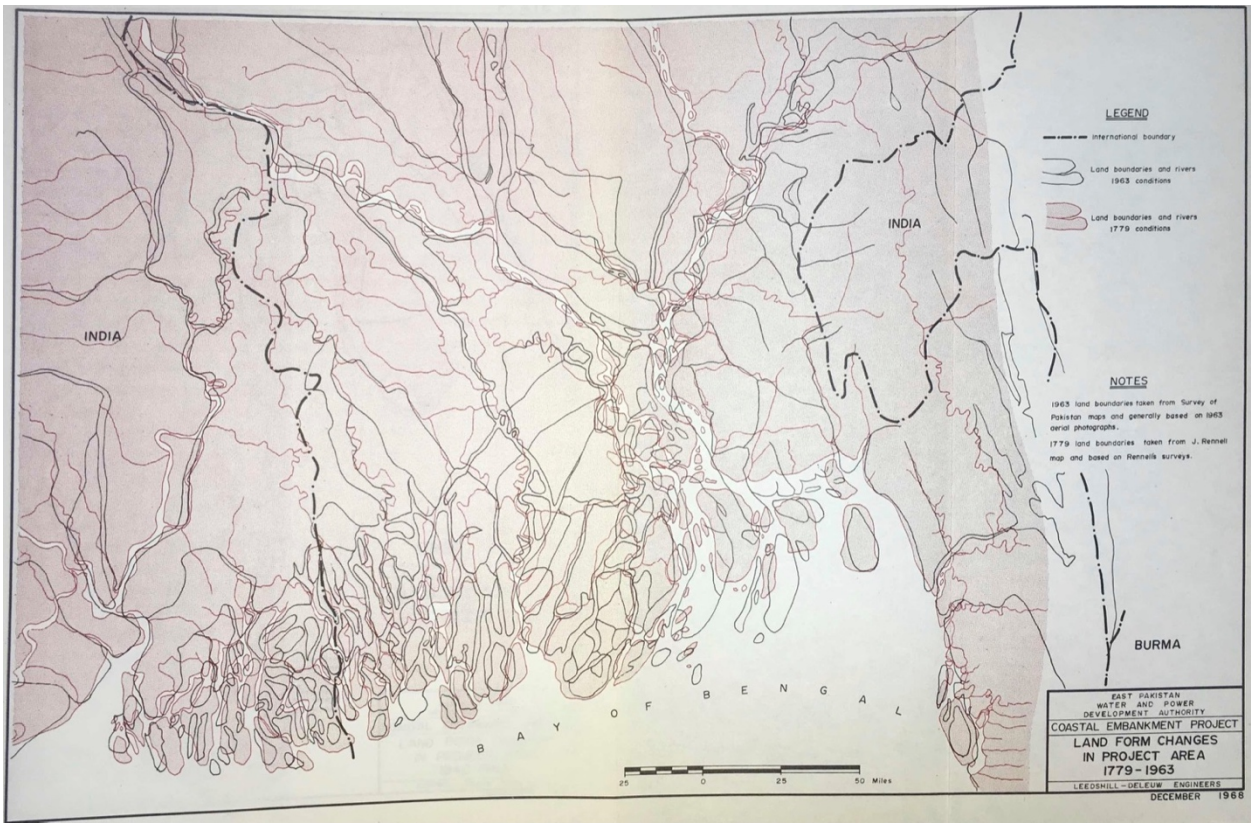

Figure 13. Map of land form changes across the coast between 1779 and 1963. Source: (Leedshill-De Leuw Engineers 1968)

Imagination

The imaginative geographies of catastrophe and dystopia that characterize the adaptation regime far predate it. Both colonial administrators and East Pakistan-era development planners described the natural threats facing the region as "existential," meaning the very continued existence of the physical space and the communities inhabiting it was imperiled. They also considered the causes as well as potential timeframes of these immanent threats to be uncertain. Moreover, the nature of these imaginaries is deeply shaped by normative conceptions of the lives of people inhabiting these landscapes.

In describing the Sundarban region in both official documents and popular texts, colonial officials described rural life with great linguistic flourish, using words such as dreary, gloomy,

desolate, miserable, depressing, miasmatic, and umbrageous. Paul Greenough describes colonial accounts of the Sundarbans as involving "extravagant rhetorical effort" (Greenough 1998, 238). These accounts of the Sundarbans often blended imperial and scientific authority with the exaggerated affect of dystopian fiction. H. James Rainey, a British subject writing from Khulna,[28] published a fictionalized account in the Calcutta literary journal *Mookerjee's Magazine* of the apocalyptic end of the imaginary coastal city of Bangálah:

> "Let us imagine the last day of Bangálah,–the utter annihilation of a populous city. How was this over-whelming calamity brought about? Did it sink beneath the surface of the dark waters of the Bay, amid the convulsions of nature? That page of history which ought to have recorded such an appalling event, is, at least as far we are aware, a perfect blank, so we think we may be allowed to fill it up as we best can." (Rainey 1872, 348)

Rainey continues in detailed, theatrical narration to describe the "shreaks of a hundred thousand frantic souls" perishing in a violent cyclonic storm surge: "Sunk underneath the Indian flood!" The story ultimately fizzles out in muddled speculation about the fate of the "Muhammadan" inhabitants of the coast at the "gates of high Heaven" who were "ill prepared indeed to face the Eternal" (Rainey 1872, 348). While Rainey's environmental fable was plainly fictionalized, it reveals the affective qualities of colonial dystopic imaginaries. The imaginative force of these narratives encouraged colonial attempts to control and subdue the physical and ecological landscape (and to extract from it). To the extent that these imaginaries fortified such efforts to intervene in the landscape, which in turn resulted in greater threats to the environment and is

[28] Rainey himself was a charismatic and infamous character, who purchased and inhabited a large *zamindari* estate near Khulna, which he called "Rainey Villa" (Rainey, 1897), for the purposes of cultivating indigo (Westland, 1874). In 1874, Westland, then the Magistrate of Jessore, wrote that the sub-division of Khulna had been originally established in 1842 with the "chief object... to hold in check Mr. Rainey, who had purchased a zemindari in the vicinity and resided at Nihalpur, and who did not seem inclined to acknowledge the restraints of the law" (Westland, 1874, pp.221-2). The antipathy between Rainey and colonial administrators appears to be mutual. He was among the most vociferous opponents of the transition away from the promotion of Sundarban land reclamation (examined further below), which he described as "retrograde" (Rainey, 1891, p.279), accusing the government of "neglect" for failing to recognize the role that Sundarban reclamation could play in the mitigation of famines (Rainey, 1874, p.332). His dystopic imagination of Khulna combined with these proposals of intervention suggest that Rainey may have been an early adopter of *anticipatory ruination* (examined further in Chapter 3).

inhabitants, they supported the production of the very future to which their anxiety was oriented. These imaginaries resonate powerfully with contemporary accounts of climate crisis, in particular the narratives I describe in Chapter 2 as "climate crisis memoir."[29]

Environmental threats coalesce in these imaginaries with more general misfortunes and failings understood to characterize the lifestyle of rural coastal inhabitants. Thus one former Inspector-General of Forests wrote that "to live in a boat in the Sundarbans is charming, for you have the means of escape under your feet; to live on land must be horrible in the extreme" (Eardley-Wilmot 1910, 236). As these accounts of coastal life unfold, the reader finds that subsidence, cyclones, and other biophysical risks are lumped together with imaginaries of socio-political hazards, such as the threat of Portuguese and Arakanese[30] pirates and of "Jungle Fever" (Mukherjee 1983; Phillimore 1945; Rainey 1868; Mackay 1860). The frequency of disasters and imagination of environmental catastrophe seem to be inseparable from these concomitant dangers.

Moreover, fearful and derisive reflections on the landscape are blended with aspersions on the moral fortitude of its inhabitants and their cultivation of it. The failure to subdue the catastrophic environment of the Sundarbans is attributed to the "indolent and improvident habits" (Hamilton 1828, 183) of its "heathen natives" (1859, 19), their "unambitious" disposition (Mundy 1858, 283), their aversion to "even the semblance of innovation" (Hamilton 1828, 189) and to their possession of "neither the means nor the intelligence necessary" to improve the landscape or its cultivation (O'Malley 1908, 100). Thus we find that the imaginative geographies of dystopia in the Sundarbans are shaped as much by the orientalism of the colonizers as they are by a study of the biophysical dynamics of the environment itself.

---

[29] This analysis also resonates with Franklin Ginn's argument that contemporary fictional fantasies of climate apocalypse support the production of the Anthropocene (Ginn, 2015).

[30] In the colonial period, both the British and Bengalis consistently referred to this group, indigenous to a shifting region straddling what is now the border of Bangladesh and Burma, as "Mugh" (Eales, 1892, p.197). I avoid using the term here because it is considered to be derogatory.

A paradox woven throughout these imaginaries is that they fluctuate between embracing these dystopic qualities as threat to and opportunity for accumulation in the region. One recurring trope involves discussions of the fertility of the soil, including normative claims about its implications and virtues. On the one hand, this fertility is acclaimed for what the colonizers seem to regard as limitless potential for extraction. One British Conservator of Forests wrote of the Sundarbans that "Reproduction is most favorable... It has been put forward that reproduction all over the Sunderbuns is unlimited, and that cleared blocks will be covered again with forest in a very short time" (Schlich 1876, 9). During certain time periods, this unlimited potential was taken as a justification for unrestricted deforestation and resource extraction from the region. Yet at the same time this fertility presented a challenge to colonial administration of the land and its resources. One official demonstrates this paradox in remarking on the villages of the Sundarbans region through vivid descriptions of their "sluttish, careless, rotting abundance" (Seton-Karr 1883, 424). Even as they praised it for its promise in greatly expanding the taxation base of the Raj, administrators lamented this fertility as "excessive" (Rainey 1891) "evil" (Westland 1874, 178), requiring careful and constant management in order to be brought under controlled cultivation. The proclivity of reclaimed lands to relapse rapidly into untamed jungle undercut their attempts to subdue expanding Sundarban estates for planned and managed cultivation of rice.

Experimentation

In response to these dystopic imaginaries, successive development regimes have devised a variety of technical and social experiments to transform the landscape and the communities that inhabit it. The uncertain threat of environmental crisis has consistently been evoked as the specter demanding these experiments. As one English merchant wrote,

> "Every thing and every one must be prepared to see a day when, in the midst of the horrors of a hurricane, they will find a terrific mass of salt water rolling in, or rising up upon them

> with such rapidity that in a few minutes the whole settlement will be inundated to a depth of from five to fifteen feet! unless it be duly secured against such a calamity by efficient bunds, say of 20 feet high... Such a visiting may not occur for the next five years, or for the next twenty years; but it may occur in the coming month of October." (Piddington 1853, 20)

These "bunds," or embankments, then, have consistently been proposed as possible safeguards against potential future destruction. Designs for such protective infrastructure have drawn on a broad range of engineering technologies and scientific hypotheses about effective management, while questions have also consistently been raised about the suitability of these technologies to local conditions. Experimentation with embankments in the Sundarbans served a dual purpose: both to protect land from inundation, and also to exercise greater control over water and sediment, the movement of which caused the river channels to shift (impeding ship traffic within them).

During the colonial period, the construction and maintenance of embankments was a constant preoccupation of administrators concerned with governing the Sundarbans and was employed for the purposes of both protection and appropriation. Beginning in 1770, the East India Company began building embankments in the Sundarbans for the purposes of artificially building up land mass through the accretion of sediment (see Figure 15) in order to expand the area under cultivation (Bandyopadhyay 1987; Maitra 1972).[31] This work of land reclamation resulted in rapid deforestation and expansion of the area of settlement and cultivation. The 1908 Khulna Gazetteer thus stated that "the forest is being replaced by smiling rice fields" (O'Malley 1908, 2) and "cultivation and villages now exist where a century ago all was waste" (O'Malley 1908, 3). As these marshy lands were embanked and drained through protection from tidal inundation, the boundaries of the forested area of the Sundarbans gradually shifted southward.

[31] The history of habitation in this region is contested, but Mukerjee asserts that land reclamation began in the region in the 15th century (Mukerjee, 1938, p.137), while Eaton suggests that forest clearing for the intensification of wetland rice agriculture began here in the 13th century under the rule of independent Indo-Turkish sultanates (Eaton, 1990).

This reclamation took place through active promotion by the government. Land settlement and taxation laws were written specifically for this purpose, creating incentives for bringing wastelands under cultivation and penalizing tenants for not bringing their entire plots under cultivation within fixed periods. Renting out land as Temporarily Settled Estates allowed for the government to extract greater rents from tenants over time, unlike lands within the area of the Permanent Settlement (for which revenues were fixed). For example, between 1882 and 1901, the land revenues of Khulna almost doubled, an increase attributed primarily to the enhanced rents from reclaimed land in Temporarily Settled Estates in the Sundarbans (O'Malley 1908, 149). The majority of these leases of uncultivated lands were granted to British subjects, owing to their "superior knowledge" (Das 1996, 58), as well as to high-ranking Indian mercantilists with positions in the Revenue Department of the Raj.

Needless to say, these urban elites who were granted leases in the Sundarbans did not themselves undertake the task of land reclamation. The labor required for this work of reclamation was significant as well as arduous, involving manually clearing the densely forested jungle for planting. Administrators often sought to secure the labor of raiyats (peasant laborers) who were already locally employed in government salt manufacture (which did not require land reclamation (Westland 1874, 68). In the late 18th century, a scheme was even floated to expand the cultivated area of the Sundarbans through grants of wasteland to convicts (Westland 1874, 63).

One Indian Geographer estimated in 1969 that in the preceding 200 years, about half of the 20,950 km^2 of Sundarban forest had been prematurely reclaimed (Mukherjee 1969a, 311).[32] If the environmental impacts of this reclamation were not well understood before it began, they

[32] "Premature reclamation" is a contested category. While it refers to the act of constructing embankments to artificially trap sediment and build up land, there is no obvious boundary between this kind of intervention and the act of constructing an embankment around a secure piece of land to prevent erosion and inundation. Given the active nature of the delta, in the absence of intervention, any piece of land relatively proximate to a river is liable to erode away in due course.

quickly began to make themselves apparent. As the reclaimed area expanded (see Figure 15), the tidal flow was cut off (Westland 1874, 180), accompanied by a cascading series of environmental threats. The river channels began to silt up, meaning that alluvial sediment, without having space to flow onto land during tidal inundation, was instead deposited on the bed of the rivers and canals, which slowly became narrower and more shallow (see Figure 14) (Bandyopadhyay 1987).

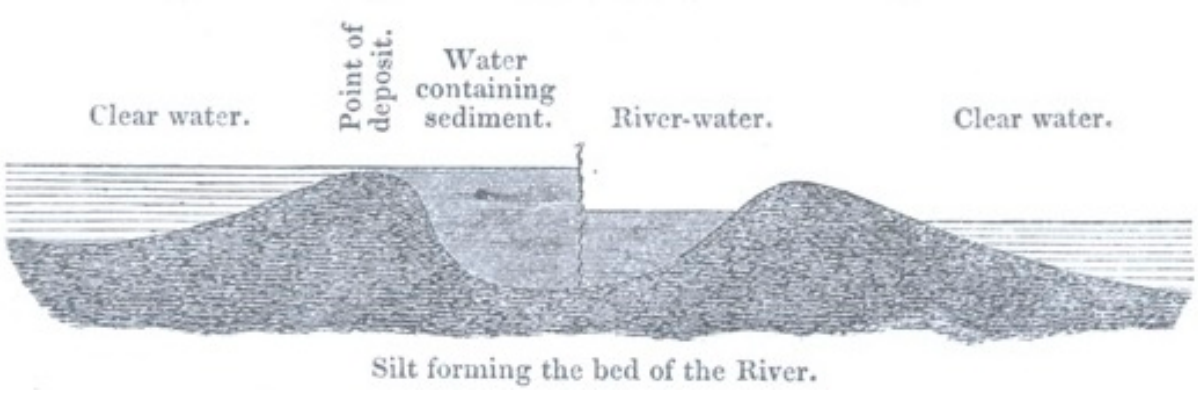

Figure 14. Diagram of process of river bed siltation. Source: (Fergusson 1863)

As the channels narrowed, they became hydraulically "unfit," meaning the water becomes so concentrated in the remaining space that it puts excessive stress on the embankments, which as a result periodically breach (Maiti, Das, and Majee 2010, 25). Meanwhile, in the absence of the sediment deposits that formerly built up the land within the embankments, the contained area gradually subsided (Das and Maiti 2010, 25; Bhattacharyya 1990).[33] With the river beds rising and the settled land inside the embankments falling, drainage became more difficult as the high tides (and even sometimes the low tides) were higher than the land, resulting in water logging where there was insufficient space for water (either from breached embankments or rains) to drain back into the rivers through gravity (IOR 1915, 3). Each of these biophysical phenomenon resulting from

[33] Subsidence is also the result of tectonic movement and sediment compaction. However, the net result of these physical processes was historically counteracted throughout most (though not all) of the coastal region by ongoing tidal sediment deposition (Nicholls et al. 2013; Wilson and Goodbred 2015)). Thus, this current observation of change in elevation is most appropriately described as net subsidence.

embankment construction continues to play an important role in the physical (and social) landscape of Khulna.

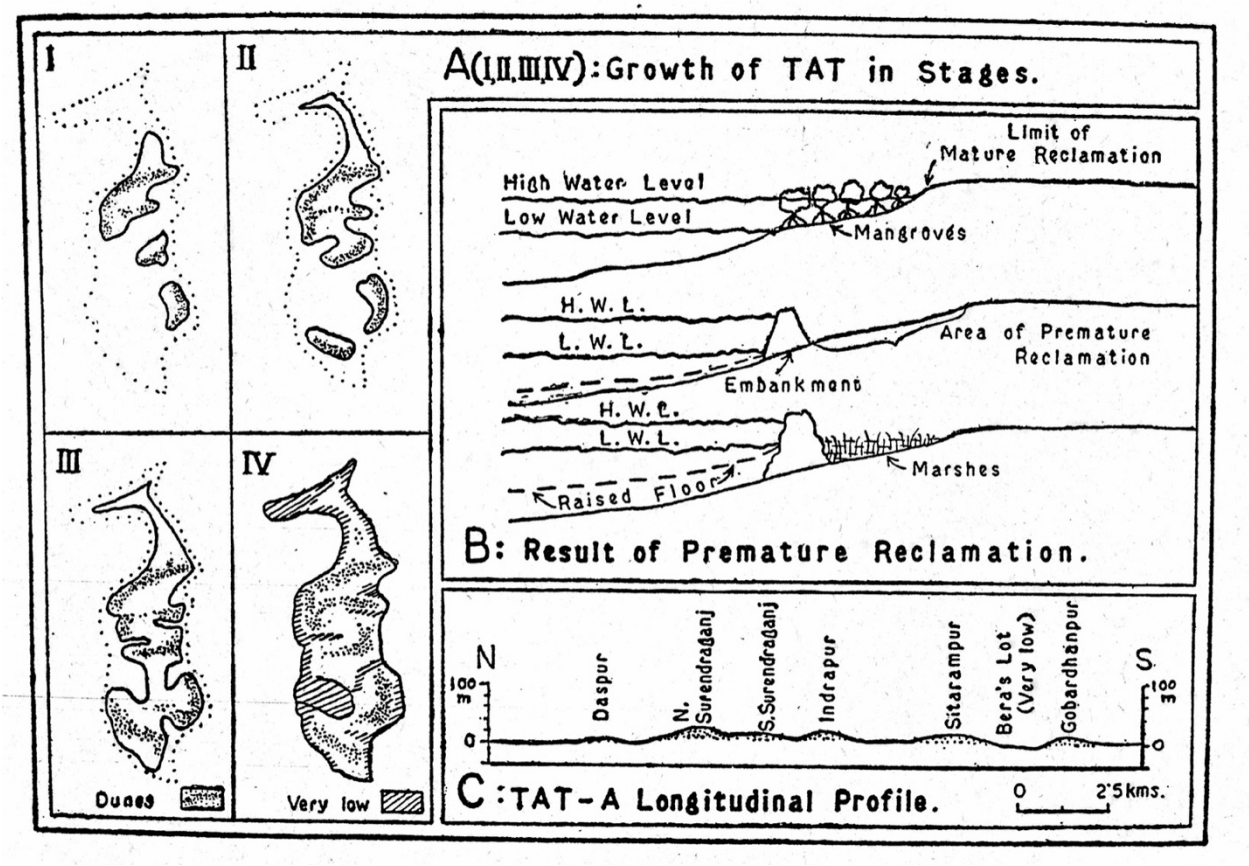

Figure 15. Process of land reclamation. Source: (Mukherjee 1969b)

This dynamic of using embankment technologies to artificially reclaim land in the delta continued during the East Pakistan period. It was entrenched through the creation of the East Pakistan Water and Power Development Authority (EPWAPDA), an autonomous government agency that by the 1960s was receiving approximately 20 percent of East Pakistan's development resources, an estimated 15 to 20 percent of which was paid directly to foreign consultants (Thomas 1972a, 8). The projects of EPWAPDA to develop new water infrastructures throughout East Pakistan embodied the donor-driven, high-cost, technically complex infrastructure design that characterized post-war high modernist development planning. These programs also diverged

further from local water and land management regimes than ever before. One USAID consultant wrote in a scathing evaluation of their programs that

> "Engineers working on every one of [EP]WAPDA's projects under valued the importance of communicating with farmers to gain their support, organizing them for irrigated farming, and assisting them in learning to produce under new conditions. Too often the solution to agricultural problems was to go ahead with design that suited engineering requirements and assume that a call for more agricultural extension officers or technical assistance will solve the problems. [EP]WAPDA projects adequately proved that this easy formula was totally inadequate." (Thomas 1972a, 30)

In Khulna, this inadequacy was largely manifested in the biophysical phenomena described above resulting from embankment engineering interventions. The failure of these programs in design and maintenance, as well as the inadequacy of the response to the recognition of these failures, poses perhaps the greatest challenge to coastal communities in Khulna today.

The most significant of these projects undertaken by the EPWAPDA was the Coastal Embankment Project (CEP) (see Figure 16). The existing embankments built prior to independence had been rebuilt annually, allowing for seasonal inundations that facilitated the periodic deposit of sediments in tidal floodplains. This maintenance was supported by zamindars (large land holders), with the labor of the cultivators. After the collapse of the zamindari system after independence, the embankments deteriorated (Leedshill-De Leuw Engineers 1968, 18). The CEP was developed not only to restore the embankments, but to establish an entirely new water regime in the coastal region. Initial plans were developed by the International Engineering Company (IECO), a San Francisco-based firm that developed several major infrastructure programs for EPWAPDA through financing from USAID (Agency for International Development 1967), along with additional engineering consultants from another San-Francisco-based engineering firm, Leedshill-De Leuw (Leedshill-De Leuw Engineers 1968). The latter wrote in their initial report that the project "will rank among the largest undertaken by Pakistan and will rank high on the list of earthmoving projects in the entire world" (Leedshill-De Leuw Engineers 1968, 155). Initiated in 1961 at an

estimated cost of US$55 million, plans, timeframes, and costs of the project repeatedly swelled, such that by 1971, estimated costs had grown to US$278 million (General Accounting Office 1971).[34] In planning reports, foreign consultants repeatedly invoked the "existential" necessity of this undertaking to East Pakistan, suggesting that the physical existence of the province and the survival of its population was at stake (National Research Council 1971; United Nations Water Control Mission to Pakistan 1959). Yet, at the same time they also recognized the potential impact of the CEP on the U.S. Economy. One USAID report justified the loans to Pakistan for the CEP candidly,

> "The loan funds will be used for the purchase of services (and possibly a small amount of goods associated with these services) in the U.S. U.S. firms and experts will be employed. Local currency costs of contracts will be met by the GOP - thus there will be no direct outflow of dollars. The effects of the loan on the balance of payments initially will be neutral... In the long run, the loan will have a favorable effect on the balance of payments, because the full amount of the loan including interest will be repaid to the U.S. In dollars." (Agency for International Development 1967, 38)

If the economic motivations of the project for the consultants (who designed and then were paid to manage the construction of the embankments) were clear, the impact on the coastal region and its inhabitants was even more dramatic. The CEP was designed to protect coastal lands from tidal inundation in order to expand the cropping area for increased food production. Planners estimated that upon completion, the approximately 2,000 miles of embankments would provide protection for 3.4 million acres of fertile land across four coastal districts (including 1.26 million acres in Khulna alone) (International Bank for Reconstruction and Development 1972b; Bari 1978, 18). The essence of the plan was to build a system of 108 polders (today there are a total of 123) across the coast. "Polder" is a Dutch word for a low-lying tract of land completely surrounded by a

[34] One USAID report explicitly states that "the scope of the project was expanded in fiscal year 1962, on the basis of a plan prepared by a U.S. engineering firm" (General Accounting Office, 1971, 55), suggesting that Leedshill-De Leuw was initially hired to manage the CEP, and they quickly expanded the scope of work of the work they were intended to undertake.

protective dike; the infrastructure is intended to artificially isolate the polder from the adjacent hydrological system, allowing internal water levels to be controlled through mechanical pumps and sluice gates. New agronomic conditions within the polders would allow for the expanded cultivation of new high-yielding foreign rice varieties (International Bank for Reconstruction and Development 1972c). By creating these larger land units and eliminating the movement of water through tidal streams within them, the polder system was designed to ultimately close off the coastal estuaries (International Bank for Reconstruction and Development 1972d).

Figure 16. 1968 map of plans and status for CEP polders in Khulna. Source: (Leedshill-De Leuw Engineers 1968)

However, problems with the technical design of the polder system manifested almost immediately. The embankments cut off the flow of water necessary for agriculture in many parts of the polders, while causing water logging in other parts where they inhibited drainage (National Research Council 1971, 38; Saifuzzaman and Alam 2010; Leedshill-De Leuw Engineers 1968;

Advisory Group on Development of Deltaic Areas 1966). In some areas, faulty designs exacerbated saline intrusion and siltation, as opposed to preventing them (Bari 1978).

These problems highlighted in particular the failures of local consultation and lack of understanding of the complex delta environment among the foreign consultants employed in project design (Thomas 1972b). One researcher likened the attempt to transfer poldering technologies from the Netherlands to treating Bangladeshis "like guinea pigs in a laboratory" (Warner 2008, 142). Others highlighted the inadequate understanding of consultants in topography, sedimentation, and local socio-economic and agronomic conditions (Nandy 1991; Thomas 1972c; National Research Council 1971, 38). One report indicated the cause of these failures more directly, in explaining the particular inappropriateness of these highly experimental technical designs in Khulna's uniquely dynamic landscape,

> "there is considerable risk in an area like East Pakistan in dependence on mechanical and human efficiency, particularly if the decision-maker, the operator of the machinery, does not share the priorities and interests of those dependent on him. The hazards of creating a situation in which the welfare of a large number is dependent upon the precise timing and reliable operation of a human and mechanical system in an environment not conducive to this type of precise efficiency constitutes a drawback of the polder project concept." (Thomas 1972a, 21)

As this indictment of the CEP indicates, the failures of these infrastructures were the result more of the experimentation in technological design than of the region's particular environmental challenges. Shapan Adnan has described this experimental technocratic approach as the "dryland" view, which is directly opposed to the "wetland" vision which characterizes the region's indigenous water regime (Adnan 2009). The dryland vision entails a complete rupture with existing agrarian water management practices, and a failure to recognize their advantages in relation to soil fertility, maintenance of groundwater reserves, and the natural breeding of wild fish populations. Instead, this view sees the traditional flooding patterns of Khulna's wetlands as a threat to be eradicated through central planning and landscape engineering.

While donors and consultants continued to pursue this approach by adapting and expanding the polder system as challenges arose, resistance to these new experimental designs quickly emerged. In the final chapter of Leedshill-De Leuw's 1968 report on the progress of the CEP construction, they briefly note that several local governmental bodies in Khulna requested that infrastructures not be built in their localities due to the problems already emerging. The engineers, however, demurred, explaining that "positive benefits and economic justification can be shown" (Leedshill-De Leuw Engineers 1968, 296), and thus construction would continue. On several occasions, local farmers took resistance into their own hands by physically dismantling sections of the embankments to restore the flow of water (Rahman 1995; Koch 1991; Leedshill-De Leuw Engineers 1968; Nandy 1991).[35] These events recall earlier resistance to embankments during the colonial period, during which administrators complained of cultivators intentionally breaching protective embankments in order to allow water to flow in to irrigate their fields, thus undermining the integrity of reclamation infrastructures (Harrison 1875, 5; Westland 1874, 121). In the late 1980s, when development agencies proposed a dramatic expansion of major flood control infrastructures, building on the same technical approach as the CEP, known as the Flood Action Plan (FAP), civil society activism against the plan was so robust that it had to be completely withdrawn (Boyce 1990; Adnan et al. 1992).

One of the most significant problems that emerged in the years following the initial construction of the polders in the 1960s, continuing to plague the coastal region today, has been the failure to plan or make provisions for their maintenance. Though this lacuna has been recognized repeatedly throughout this period of development planning, it remains a primary cause

[35] Thomas cites similar problems in 1964 and 1965 with another WAPDA embankment project further north (the Ganges-Kobadak Project). Out of desperation for water to irrigate their rice fields, farmers cut the embankments to allow water to flow in from the river. On both occasions they were fired on by the police and several farmers died (Thomas 1972b, p.16).

of the most serious failures of the embankment infrastructures. The CEP was designed following the Dutch polder model, which relies fundamentally on considerable annual maintenance paid for by both the national government and local municipalities (the Dutch spend about €500 annually on maintenance alone for existing water control infrastructure, though this is expected to increase dramatically as new plans are developed to address the threat of climate change) (Dutch draw up drastic measures 2008; Stijnen et al. 2014). The initial plans for the CEP recognized that its success was contingent on the proper operation and maintenance of the polders; in lieu of making provisions for this maintenance, the plan indicated that it would be the responsibility of the farmers who were benefited by the protection (Leedshill-De Leuw Engineers 1968). However, even these early reports indicated an awareness that this would not be feasible. Leedshill-De Leuw's 1968 report on the CEP explained that "Farm sizes smaller than about five acres would not have the payment capacity for project costs, except by reducing the farm family living expenditure." With 78% of farms in Pakistan being less than 5 acres in 1960 (Bose 1972, 79), this plan to have individual farm households provide for the maintenance of the CEP was clearly not grounded in a realistic analysis of the local agrarian political economy (van Ellen 1991).

Additional problems included the recognition that it would be necessary to pump water out of the polders (as opposed to allowing gravity to propel drainage through sluice gates), though the costs and installation of pumps were not included in project design or donor plans (National Research Council 1971). Recollecting problems observed in the colonial period, the failure of sufficient maintenance of the embankments has exacerbated problems inherent in their design, resulting in the weakening and breaching of embankments, siltation of internal canals, and intractable water logging due to insufficient drainage (Koch 1991; Soussan 2000; Swingle et al. 1969a). Building such a massive flood control infrastructure without the plans or capacity to maintain it was itself a kind of experiment undertaken by consultants, donors, and the local

bureaucracy that relied on them. Today, Bangladesh continues to grapple with the aftermath of these failed landscape engineering experiments of the Pakistan period. Their legacy fundamentally shapes the region's vulnerability to climate change, both present and imagined.

Dispossession

These modes of experimentation in landscape engineering and land management ultimately facilitated extraction through the dispossession of local inhabitants. In imagining the dystopic present and future of the Sundarban region, the administrators of successive development regimes have sought to intervene in the landscape in ways that transform it to enable accumulation. Examining this historic pattern of intervention illuminates the longer trajectories of accumulation by dispossession in the delta.

The adaptation regime exhibits a much longer historical pattern of intervention based on normative conceptions of the value of this landscape. In particular, questions about whether the Sundarban region is worth saving have been a recurrent theme in these attempts to govern the region. The 1875 Bengal Embankment Manual, that sought to codify the norms and laws around how and when to protect, reclaim, and reshape which lands, asked "The only question that can arise in these tracts is whether the country to be protected is worth the cost of the protective works" (Harrison 1875, 29). This fundamental question has beset every subsequent development regime in the region. Meanwhile, the sense that the land to be protected is not worth the cost of the protective works, or not worth the risk of the experimental proposals for protection, has consistently been a driver of dispossession.

The Bengal Embankment Manual also prescribes that the benefit of embankments must be "large and general" (Harrison 1875, 14). The vagueness of this dictum allowed for the normative assessment of what constitutes a "large and general" benefit to shift over time and to be applied

unevenly. The shift from local toward central control of embankment infrastructures over time facilitated this. While this centralization can clearly be observed in the CEP and the FAP examined above, it had already begun in the colonial period.

As explored above, colonial administrators repeatedly used the unique biophysical features of the landscape as justification for shifting land management regimes in the Sundarbans (O'Malley 1908, 83). This often meant unsettling claims of cultivators to self-determination in the use and management of their lands. The "temporarily" settled legal status of the Sundarban land tenures allowed the government to exert control over which lands would be reclaimed, how they would be taxed, and the kinds of infrastructures that could be used in protection and reclamation. Tenants in the Sundarbans who were subject to these laws repeatedly contested these fluctuations in land management policy, as demonstrated in legislative records concerning disputes over taxation, lease renewal, and land management (Gupta 1935).

The administration of Sir Richard Temple, Lieutenant Governor of Bengal from 1874 to 1877 provides an indicative case of the fluctuations in these administrative regimes. During a visit to the Sundarbans at the beginning of his tenure as Lieutenant Governor, Temple observed that the forests were home to an abundance of timber resources that were valuable for fuel for the growing capital of Calcutta, as well as for boat building (Temple 1882, 419). The timber was also necessary to the expanding rail network and, as Buckland notes, "an experiment was also being tried for employing the *sundri* timber in the manufacture of railway sleepers," (Buckland 1901, 613; Guha 1990). This new management of timber resource extraction was at odds with the existing policy of essentially unmitigated deforestation in service of land reclamation and expansion of agricultural cultivation. In light of these observations, Temple somewhat abruptly shifted government forestry policy in the Sundarbans away from active land reclamation and deforestation toward the

controlled management of forest resources to facilitate their extraction and taxation.[36] By 1904, 78 percent of the total forested area of Khulna had been categorized as protected forest "as a means of ensuring a continuing supply of timber and other forest products" (Richards and Flint 1990).

Temple's new policy in the Sundarbans coincided with a broader transition throughout British India toward government-controlled forest management (Brandis and Smythies 1876), culminating in the Indian Forest Act of 1878. These shifts, Ramachandra Guha has observed, were "concerned above all with removing the existing ambiguity about the 'absolute proprietory right of the state,'" and "usurpation of rights of ownership by the colonial state which had little precedent in precolonial history" (Guha 1990, 67, 65). The prior categorization of forested lands as "waste" was invoked in service of British claims on the unalienable "right of conquest" of the colonial government, which one British administrator described as such: "We hear a great deal about the rights of *the people*, but, as a matter of fact, the State since it assumed the administration of our forests, never has admitted the existence of any class of public rights to them. To do so would be to cease to administer them" (Amery 1876, 28). In the Sundarban estates, being outside the Permanent Settlement, this meant that the government could levy higher rates of rent, and impose new conditions on land management (such as requiring the building or maintenance of embankments) (Gupta 1935). By stemming the expansion of the agro-ecological frontier, this new forestry policy put increasing pressure on zamindars, whose profits were contingent on a gradual expansion of cultivation in newly reclaimed lands. As the zamindars sought to increase their rental earnings without expanding the area of their tenure, they exerted increased pressure on the cultivators, the results of which were magnified as it was passed down through the hierarchy of sub-infeudation (Iqbal 2010; Das 1996). As Iqbal explains, "agrarian decline occurred as a

[36] Reclamation through large-scale grants to lands in the Sundarbans was officially discontinued in 1903 (Iqbal, 2010, p.27).

consequence of the erosion of cultivators' entitlement to ecological resources" (Iqbal 2010, 187). Thus, dispossession of cultivators in the Sundarbans was the result of both a shifting regime of forest management, as well as an agrarian class structure that had become increasingly stratified through the period of colonization.

Yet, it was not Temple's object simply to expand forest conservation in Bengal. Rather, he imagined colonial forestry as a science of shifting geographies based on the requirements of accumulation at different points in time. In one of many memoirs he wrote after his term of service, Temple argued that

> "National benefit would arise if the people were to migrate from one centre of industry to another, according to need. But this would be an undertaking contrary to their disposition, and certainly beyond the power of any government. Though some classes are migratory, yet the people in the main are domestic and home-abiding. They are attached to their ancestral rights in land, are fond of the fields they till, and cling to the humblest of their homestead... If, however, the people were stirred by the colonizing impulse which moves hardier and sturdier races, there is still, within the bounds of India itself, a vast quantity of arable land awaiting the invasion of the plough... [In some places,] when enquiry is specially turned towards the cultivable waste, outlying lands are found, some here and some there, the grand total of which would be anticipated by few except statisticians or surveyors" (Temple 1880, 82-3).

Temple goes on to describe the vast "wastelands" of relatively newly colonized British Burma that, in their proximity to Bengal, offered the potential for the immigration of farm labor to expand the cultivated land within the empire.[37] Thus, even as Temple laments that moving people around to serve the needs of the state would be "beyond the power of any government," he nevertheless shaped forestry policy toward precisely that end. The dispossession of agriculturalists in the Sundarbans served to expand the accumulation through the extraction and taxation of resources, as well as bolstering the growth of the industrial city of Calcutta through supporting the extraction

[37] The legacy of this agricultural labor migration can be observed in the current humanitarian crisis of the Rohingya, a stateless minority in Burma descended from landless agricultural laborers who migrated in the period prior to Partition from the region that is now Bangladesh to the region that is now Burma (Bjornberg, 2016).

of timber for fuel and other urban requirements. The imagined role of migration in this development regime shares important parallels with the imagined role of climate migration in the adaptation regime (explored further in Chapter 4).

These tensions between the agricultural cultivation and forest resource extraction in the coastal zone were a subject of ongoing debate within colonial administrations (Richards and Flint 1990). One particular debate concerning the formulation and application of these laws in Kolkata in 1915 demonstrates illustrates these debates and resistance to the dispossession they revealed. The reclamation and settlement of the Sundarbans had historically been realized through the construction of small embankments around plots of land in the tidal range, in order to protect fluvial accretions. The work of constructing these embankments was carried out by raiyat laborers, while it was supported and promoted by zamindar landlords, who were benefited by the resulting expansion of the size of their landholdings. As the goals of the colonial administration shifted, however, the government's objectives came into conflict with those of the zamindars.

Recognition of the risks of premature land reclamation led administrators to attempt to better control the construction of embankments. Whereas over a century of reclamation work had relied on intensive intervention that artificially re-shaped the landscape, suddenly administrators were concerned with understanding how the natural tidal patterns sustained the interests of the state and of capital. British forester EA Smythies observed that "the khals [tidal channels] are the natural highways for the extraction of forest produce, which is all brought out by boat, the tidal currents being utilized for conveying the boats in one direction or the other" (Smythies 1925, 41). Given this recognition of the importance of the natural flow of these waterways, it followed that the construction of embankments which would interfere with tidal flows should be controlled. Thus, in 1914 a bill was introduced to the Bengal Legislative Council proposing that all embankment construction should be at the discretion exclusively of the Government, and

impugning the "cultivators" of the Sundarbans for causing the deterioration of the tidal channels through the unauthorized construction of embankments and obstruction of natural drainage (IOR 1915). The papers documenting the deliberations over this bill reveal a heated debate over state control of land and water management in the Sundarbans.

Of the five-member Select Committee tasked with developing the legislation, two members were Indian, Hrishikesh Laha and B Chakravarti, the Secretaries of the British Indian Association and the Bengal Landholders' Association, respectively, both essentially organizations composed of and advocating for the interests of Bengali zamindars. Laha and Chakravarti objected emphatically to the proposed legislation, as well as to the characterization of the activities of cultivators in the Sundarbans which it addressed. They argued that cultivation in the Sundarbans was only possible through the prevention of the saltwater from coming in and also to retention of rain-water for irrigation purposes. These objectives were only possible, they explained, through the local and small-scale construction and management of embankments at the cultivator's own discretion (including the liberty to cut the embankments open in order to discharge excessive accumulation of water), allowing them to respond quickly and efficiently to dynamic changes in the tidal environment. The proposed legislation, they argued, would prevent the capacity of cultivators to do so, and would also undermine the legal rights of Sundarban residents and cultivators to the fluvial accretions that might emerge adjacent to their lands. At any rate, they asserted, the legislation was based on a "misapprehension of facts" on the part of the government about the natural tidal patterns of the Sundarbans and the effects of small embankments within them. Siltation of the canals, they explained, was not caused by these small embankments, it was only a naturally occurring phenomenon in these waterways which are "generally not navigable by large steamers." Beatson Bell, the Member in Charge of the committee, arguing in defense of the Bill, retorted that "it is extraordinarily difficult to define the word 'navigable,'" and "a navigable river is

a river which is navigable." Bell was arguing that any channel through which any kind of watercraft, including a simple raft, could be floated, made that channel by definition “navigable,” concluding “now, it is well known that rafts can float in almost every creek of the Sundarbans.” The crux of the disagreement is that the Indian members representing the zamindars perceived the value of the Sundarbans for agricultural production and settlement, and thus advocated for the autonomy of the cultivators, while the British members of the committee sought a shift toward the more active state management of all of the waterways and shipping routes.

Throughout the recorded proceedings, Laha and Chakravarti explain and articulate their objections to a pattern of government interference and dispossession that the proposed Bill would only entrench. They appeal to historic experience in the region, including several failed "experiments" in water and land management on the part of the Government and a general pattern of "cumbrous and dilatory" government control. The British members dismiss these charges of dispossession with reference to an alternative understanding of the region's biophysical dynamics (how the land and watercourses shifted, what the effects would be of planned management, the appropriate role of human intervention and habitation). They do so through repeated appeals to scientific expertise and their interest in "proper and expedient" management measures. In the end, outnumbered, Laha and Chakravarti were overruled; the bill passed in 1915.

While the legacy of these debates over embankment infrastructure continues to reverberate in the landscape today, the impacts of Wasteland settlement policies on land tenure have had perhaps an even more profound influence on the social life of the region today. Land tenure in the Sundarbans during the colonial period was shaped both by the particularities of policies put in place to support land reclamation, as well as the unique biophysical features of the landscape and the associated challenges of settlement. This land tenure was characterized by an extraordinary degree of sub-infeudation (relative to the areas settled under the Permanent Settlement outside of

the Sundarban tracts), with tenancies being multiply sub-divided into an extensive hierarchy of sub-tenures. The diagram in Figure 17 illustrates an example of this sub-infeudation. Taken from the Final Settlement Report off a single Sundarban estate, the diagram represents each of the tenancy strata and its leaseholders falling under the estate's zamindar.

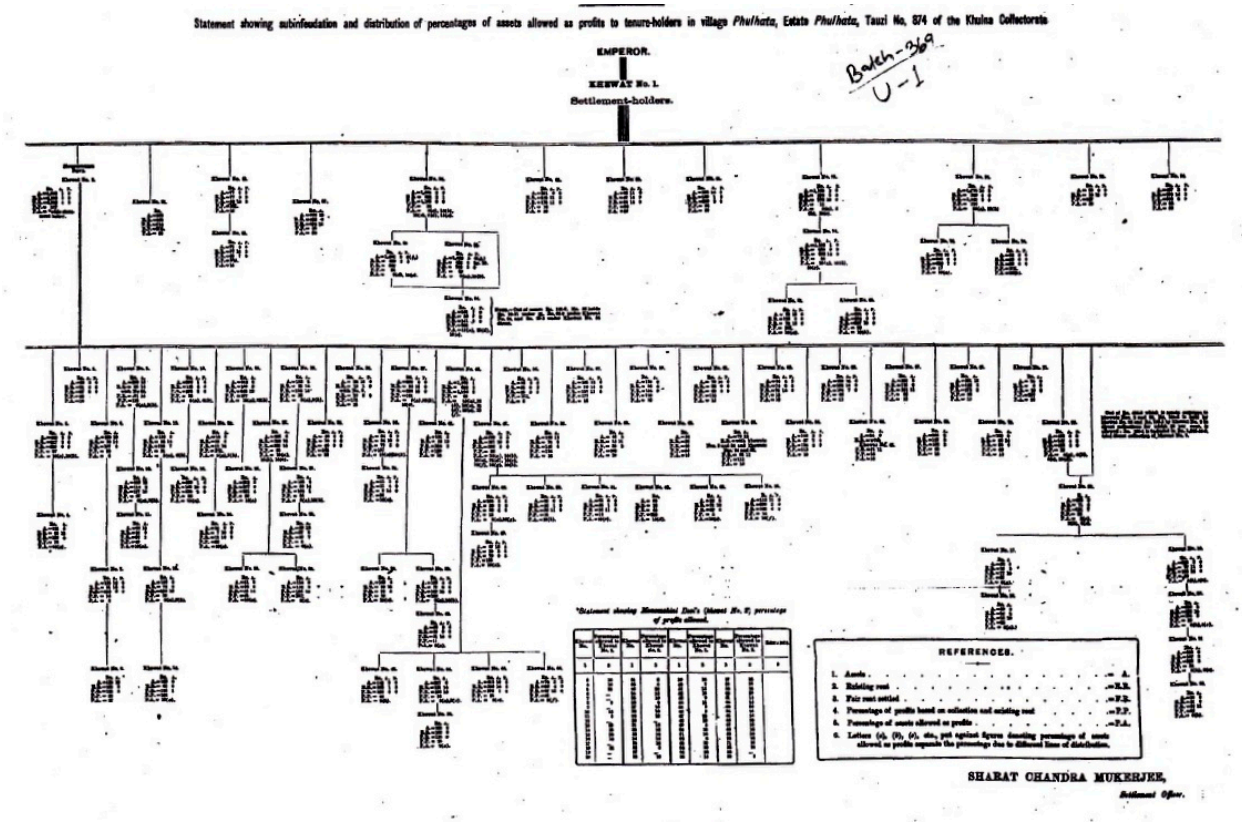

Figure 17. Diagram of sub-infeudation in Phulhaita Estate in the Sundarban region. Source: (Mukerjee 1908)

This exceptional sub-infeudation in the Phulhaita and other Sundarban estates can be attributed directly to government efforts to settle new lands in order to increase tax revenues (Hunter 1875b, 62). The "mania" among government officials to survey and sell wasteland tenancies took place with so little oversight that they often usurped lands that were already occupied (Buckland 1901, 543). Leaseholders were granted large plots in the Sundarbans under "exceedingly liberal" terms that were revised four times between 1784 and 1853 (Iqbal 2010, 27; Westland 1874). These terms stipulated that no rent would be required for periods of up to 20 years; however, these leases would be terminated if tenants failed to bring significant portions of

the land under cultivation within a stipulated amount of time. Because this reclamation could only be undertaken though considerable expense, the tenancies were usually taken by wealthy absentee inhabitants of Kolkata, about half of whom were British (Hamilton 1820; Hunter 1875b, 1875a; Sarkar 2010).[38] Clearing the dense jungle to facilitate cultivation was strenuous, carried out by hand with machetes and axes by teams of ten to fifteen manual laborers accompanied by a fakir (a Sufi holy man) entrusted with their protection from tigers (Fawcus 1927, 31). This manual labor was necessarily undertaken annually for several years before the threat of reversion to jungle subsided, and one observer noted that it took five years before the soil was domesticated enough for the use of a plow, ten years for the harrow (Fawcus 1927, 32).

This formidable enterprise of taming the land, as well as the natural fragmentation of large plots by rivers and canals, made the task of reclaiming large plots unwieldy in the expedited timeframes stipulated by the lease terms (Bose 1999, 43). Thus, reclaimed plots were substantially and increasingly subdivided at an unparalleled rate (Bose 1986, 17). This also eased the burden of the significant costs of reclamation on any single tenant holder (Bose 1993). This sub-infeudation through a network of middlemen produced what one British Settlement Officer called "the most amazing caricature of an ordered system of land tenure in the world" (cited in Eaton 1993, 221), with as many as 20 sub-tenures parceled out for a particular plot (Das 1996, 58). Land legislation explicitly allowed these middle-men to proliferate between the leaseholder and the cultivator (Field 1885; Tanigushi 1981), while the proprietors "freely exercised the power of alienation," meaning that landlords and middlemen could allocate leases to different tenants at will (O'Malley 1908, 145).[39]

---

[38] In 1871, the Commissioner of the Sundarbans reported that there were 431 such temporarily settled estates (Hunter, 1875a).

[39] In the 1908 Khulna Gazeteer, O'Malley describes instances of middlemen re-allocating leases to new tenants at a higher rate once the difficult work of reclamation and deforestation was already complete, although he also describes some tenants receiving certain privileged concessions in their leases that reflected their work to clear the jungle or build or maintain embankments (O'Malley, 1908). Iqbal speculates that

These historic modes of agrarian dispossession continue to impact rural life in this region today, contributing to the region's acute inequality of land tenure and high rates of landlessness. This inequality refracted through the failures of post-colonial land reform and new modes of market integration have resulted in structural continuities that sustain patterns of dispossession, appropriation, and unequal agrarian class structure (Adnan 1999; Boyce 1987).

Throughout the subsequent history of the region, these continuities can be traced through foreign aid relations development interventions. In an indictment of the CEP and other projects implemented through WAPDA, one USAID consultant wrote “the record of these large projects supports the conclusion that the rural people are not their primary beneficiaries” (Thomas 1972c, 7). His reflection confirms the notion that even as development regimes changed in the delta, the pattern of dispossession continued to play an important role in shaping the landscape and the communities that inhabit it. This is further demonstrated through the expression of interest in developing shrimp aquaculture in early documents related to the CEP and related development interventions. While it is commonly thought that the promotion of shrimp began in the 1980s under structural adjustment programs (Adnan 2013; Paprocki and Cons 2014), earlier development planning documents suggest that these aspirations existed from the very inception of the CEP. The stated goal of the CEP was to keep saltwater out of the polder; yet, Leedshill-De Leuw’s 1968 report repeatedly mentions the potential for shrimp cultivation within the polders by using their sluice gates to bring water in, and the embankments to prevent the water from leaving (Leedshill-De Leuw Engineers 1968). This potential for facilitating saline water intrusion to promote shrimp aquaculture was echoed by World Bank reports in 1970 and 1972 (International Bank for Reconstruction and Development 1972a, 1970), and pursued directly in 1969 through a

these differences in tenancy provisions were most likely the result of later arrivals receiving less privileges as land became more scarce and population (and availability of labor) increased (Iqbal, 2010).

USAID-supported project undertaken by researchers from Auburn University in Alabama (Swingle et al. 1969a).

In a keynote lecture given at a workshop on Integrated Flood Management in Dhaka in 2014, Ainun Nishat, one of Bangladesh's leading experts in water management and climate change adaptation, drew direct links between donor visions for expanded shrimp aquaculture and inappropriate water management technologies. Weaving between English and Bengali to a room primarily full of Bangladeshi water engineers, Nishat admonished development professionals who promote particular interventions without a full understanding of their relationship with the local physical geography. Another workshop on "Revitalizing the Ganges Coastal Zone" had taken place the immediate three days prior examining similar topics, but organized by the CGIAR research consortium and attended by a far greater proportion of foreigners, who gave presentations about research they had conducted and interventions they were promoting in water management and production systems in Bangladesh. In this speech the following day, Nishat reproached the experts in attendance at this prior conference for failing to understand the specificity of Bangladesh's coastal landscape and for seeking to apply foreign expertise to local problems. "They don't have a clue about what is the the coastal zone of Bangladesh!" he protested, saying that they had embraced an approach based on non-tidal hydraulics, totally unsuited to local conditions. He said that foreigners don't understand that Bangladesh has three different kinds of cropping seasons, and that this is important to understanding the different kinds of water management techniques suited to each of these distinct seasons. "Bangladesh is different from Malaysia!" he said, obliquely referencing the findings garnered by many CGIAR experts in South East Asia that are frequently applied to Bangladesh.[40] The CGIAR consortium, he said, "had a huge conference, they paid lots

[40] WorldFish, for example, is headquartered in Malaysia, while IRRI, the International Rice Research Institute is based in the Philippines.

of money for lots of studies, but their approach is all wrong. They want to keep the water there for shrimp." However, the conflicts between shrimp and rice were only increasing, he explained, and effectively addressing the water management challenges facing the southwestern region would require addressing these conflicts directly. Not doing so would only result in further dispossession.

As development agencies have consistently described shrimp aquaculture as beneficial, or at least benign and inevitable, they have actively ignored indications to the contrary. An evaluation conducted in 1996 of Dutch development programs in Bangladesh since Independence highlights this. The evaluation examined the Delta Development Project, a development program carried out in Polder 22 between 1976 and 1992 with the objective of "integrated development of land, water and human resources" (Netherlands Ministry of Foreign Affairs 1996, 142). Under the direction of a collective of young, idealistic activists who had been hired as consultants, the DDP worked closely with Nijera Kori to catalyze the successful organization and empowerment of landless peasant groups in the Polder. The program facilitated access to common lands by landless agricultural collectives around the edge of the entire island, and in turn these collectives took responsibility for routine embankment maintenance. However, the report indicates that the Dutch aid agency decided to discontinue the project in the late 1980s because it was at odds with the rapid expansion and "severe pressure" toward transition to shrimp cultivation in surrounding polders (Netherlands Ministry of Foreign Affairs 1996, 142). This recognition and failure to address the role of shrimp in agrarian dispossession in Khulna must be understood in the context of the much longer history of intervention in this region examined in this chapter.

As this chapter has demonstrated, human intervention in the Sundarbans region has shaped the area that is now Southwestern Bangladesh, and the social structures of the communities that inhabit it, in profound and enduring ways. Any systemic understanding of the vulnerability of this region to climate change cannot fail to take into account how these historical patterns have

shaped Khulna's geography today. Instead of thinking about these dynamics in isolation, we would be best served to interrogate them dynamically, and thus to understand how climate vulnerability itself has been historically produced.

CHAPTER 2

THREATENING DYSTOPIAS: DEVELOPMENT AND ADAPTATION REGIMES

On the sidelines of the 2015 United Nations Climate Conference in Paris, while delegates of the UN's member states were reaching a global agreement on reducing and responding to climate change, representatives of the world's leading development agencies were meeting nearby at the Development & Climate Days workshop. The goal of the workshop was to discuss strategies to "seize the opportunities presented by climate-compatible development." Through lectures, panels, role-playing games and other interactive sessions, participants discussed with an almost breathless enthusiasm the opportunities offered by climate change for realizing a particular vision of development. This vision, organizers explained, would entail "tough talk" on the transitions in energy, land use and human habitation that they described as "crucial" and "necessary." While speakers saw these transitions as imperative due to the effects of climate change, they also saw them as "opportunities." The excitement surrounding these opportunities was illuminated by colorful neon stage lights bouncing off the historic wooden beams of the handsomely renovated event space.

Throughout the two-day workshop involving eighteen plenary and breakout sessions, speakers implored the over 200 participants, primarily policymakers, scientists, and development practitioners, to "speak the language of business." Business, we were told, is a natural ally of development and climate change adaptation. "Do you accept that in the long term, development is about deep structural transformation of economies?" the leader of one major aid agency boomed animatedly into his microphone during one plenary session. Nearly everyone in the room raised their hands in agreement. He went on,

> We need to talk about development and climate change together… Development needs to be at the center of the conversation about climate change… If we go ahead 30 years down the road, if we're looking at a village today, maybe no one in that village will live there

> anymore, and they'll all be working in a garment factory down the road. So our job [as development practitioners] is to help manage that structural transformation for the benefit of the people who live in those villages.

The crowd was energized. The speaker had crystallized the vision for the future of the gathered development agencies, one articulated repeatedly through their discourse and activities concerning climate change adaptation. The specter of climate-induced ecological crisis was translated by the speaker into possibilities for industrial growth and export-led economic development (along with the demographic shifts which will accompany them).

As I watched from the back of the room, having just arrived in Paris after two years of fieldwork in Bangladesh, I was struck by how this vision of rural futures mirrored the narratives I heard repeatedly from development practitioners in Dhaka, Bangladesh's capital. It seemed that the village in this man's parable might easily be one of the villages where I had worked for several years in southwestern Bangladesh, in the district of Khulna. His narrative of rural decline, as well as his normative vision of the need for? urban development alternatives, aligned closely with the ways that development practitioners and policy makers in Bangladesh discuss the future of these villages and their inhabitants. In this coastal region of Khulna, a complex of ecological and political-economic shifts threatens rural livelihoods and even the existence of rural populations and the landscapes they inhabit. In what follows, I argue that the convergence of Bangladesh's contemporary development regime with new discourses and practices of climate change adaptation is not only transforming Bangladesh's coastal geography, but it is also shaping it as a laboratory for such development throughout the rest of the world.

This chapter examines the emergence of the adaptation regime as a mode of governing both people and landscapes in Khulna. This governance is contingent on new imaginaries of a certain and devastating future under climate change, and a discourse about the inevitability of this future both globally and in Bangladesh in particular. In response to the belief in this future, many

development agencies have begun to propose dramatic (even previously unthinkable) social and spatial re-organizations of the rural coastal zone of Bangladesh, a dynamic that I refer to as "anticipatory ruination, and which I explore further in Chapter 3. Although the vision of these agencies is predicated on many of the same assumptions and goals that have characterized the development project (McMichael 2004) since the 1950s (Hart 2001; McMichael 2008; Watts 2008), the discourse of climate change makes them different in their appeals to urgency, inevitability, and appeals to scientific authority. Through the adaptation regime, the dispossession of rural communities and growth of an urban industrial economy come to be seen as both inexorable and propitious futures.

Who is the Adaptation Regime? Where is the Adaptation Regime?

Who are the actors who build, shape, participate in the adaptation regime? What are their interests? What do the everyday practices of this work look like? What kinds of fissures exist in their narratives and approaches? The greatest challenge in studying the rise of a social construct like the adaptation regime is in attempting to answer such questions in the context of great diversity and thus to understand how power operates in this context without reify it. The adaptation regime is not unified or coherent; it is not a "thing." Yet it does involve systems of practices and ideas that must be understood collectively.

The adaptation regime is illuminated through both the "common sense" and "counter-discourse" of the actors who operate within it (Wolford 2010; Abu-Lughod 2000). My ethnographic practice among these actors involved a variety of both formal and informal exchanges, from observing their public dialogues at large conferences, to private conversations in their offices, chats over lunch or tea, on boats and in cars in Dhaka's infamous traffic jams. Amongst these different settings, it became clear that these diverse actors variously advanced,

consented to, and challenged public narratives of their own agencies and the broader regime of which they were part. While I would frequently hear them clearly articulate a dominant discourse of adaptation imperatives, these actors (more often in private) would also cite discrepancies, or acknowledge their own reservations when I myself questioned them. It is through such contestations and conjunctures that hegemony itself is actually produced (Goldman 2005, 24).

For actors within development agencies, this often meant an explicit or implicit acknowledgment of the silences their work engendered. While there was broad commitment to the idea of the need for action related to climate change, these actors often acknowledged to me that their interventions would be the same regardless of climate imperatives. It also meant recognition of the normative work done to frame both narratives and interventions. They were also often aware of the politics that they felt they necessarily ignored. For example, I regularly asked questions of staff at large aid agencies about land politics, and their programs' disregard of them in imagining climate change adaptation. I found that they frequently agreed with me that addressing land inequality could have a significant impact on the vulnerability of coastal inhabitants, but they explained that doing so would be "messy," would take more time than they had within their program cycles, and was generally beyond the scope of what they felt they could accomplish. One donor from DFID, responding to my question about concerns with land grabbing and related water management conflicts, explained “dealing with all that social stuff is very complicated, time consuming, and does not consume a lot of money. But if you’ve got a lot of money to spend, infrastructure is the way to do it.” The implication here is that investing in projects like embankments, which are considered less politically contentious, are less complicated for donors, and in facilitating large capital expenditures, allow them to demonstrate significant impacts of their work. Yet, this donor also recognized the implications of these gaps to their programming, later explaining to me “We could do better in understanding the political economy and governance

issues before we launch into proposing solutions." My questions about development agencies' support of shrimp aquaculture were frequently met with similar agreement. While USAID is one of the major supporters of the expansion of shrimp aquaculture in Bangladesh, I heard reports from several staff there about contentious debate within the agency itself about whether they should support it, citing negative social and environmental impacts.

Similar contestation exists among local Bangladeshi actors who participate in the adaptation regime. Government bureaucrats and local staff of NGOs would frequently explain to me that a particular narrative or approach was necessary for the sake of the Bangladeshi nation, which needs the funding that is made available through bi- and multi-lateral climate change funds. Sometimes they would legitimize certain actions by explaining that it was the donors who made the decisions about the kinds of development activities to pursue and promote. With shrimp farming in particular, personal experiences and entanglements often shaped their opinions about aquaculture or its use as a climate change adaptation strategy. Given the investments in aquaculture among urban elites, I met many actors who had (or had family members with) personal financial interests in the promotion of shrimp aquaculture; at the same time, several such people now living in Dhaka grew up in villages in Khulna and expressed conflicted feelings about the changes they had observed in the landscape through the transition from rice to shrimp. Thus, even as I deploy categories such as development practitioners, government bureaucrats and scientists, I am conscious of their own recognition of the incoherence of their narratives along with their responsibility to advance them.

While there is significant diversity within these categories of actors participating in the adaptation regime, the categories of "local" and "international" are equally incoherent. Neither do these categories map clearly onto the interests or motivations of various actors. Both Bangladeshis and foreigners participate in the adaptation regime. Yet the experience of most of these actors is

profoundly transnational, shaped by often decades of experience working and negotiating with a variety of international actors, both in Dhaka and abroad. Even as claims to local knowledge and perspectives are based on true experiences, the experience of being a Bangladeshi is not unitary, and is itself shaped by class, gender, livelihood, and a variety of other socio-cultural factors. The ideas of these actors about possible or desirable futures under climate change are profoundly shaped by these transnational circuits of knowledge and capital. Thus, even as we examine the particular historic and geographic specificity of the adaptation regime in Bangladesh, we must necessarily understand it as a node in an international political economy of development that is always and already shaped by global actors and processes.

Imagination

The role of Bangladesh in understanding the impacts of and adaptation to climate change and, conversely, the role of climate change discourse in understanding Bangladesh's development landscape today, are equally important dynamics in the adaptation regime. In interviews I conducted as well as public events in Dhaka, development practitioners and government officials alike asserted the inseparability of climate change from any possible imagination of Bangladesh's future. Every conversation about Bangladesh's development over the next decade to the next century thus must reflect on and respond to the possibility of climate crisis, a continuously asserted existential risk. The notion of this inseparability is an important tenet of the adaptation regime, and is what makes Bangladesh the ideal site for its establishment.

At a public seminar in Dhaka in January 2015, the Secretary of Bangladesh's Ministry of Environment and Forests, the primary ministry tasked with managing climate change adaptation efforts, appealed to the audience of adaptation experts (practitioners and academics) to recognize the importance of Bangladesh in this global adaptation landscape. "This is the ground zero of

vulnerability," he proclaimed, it is "disaster's homeland... We are living testimony of what is happening due to climate change." The Secretary's concern with framing this relationship indicates the importance of establishing Bangladesh both epistemically and ontologically in this global regime. The international finance and support of adaptation programming in Bangladesh is contingent on the ideological consensus concerning its vulnerability. It is this sense of crisis that creates opportunities for new frontiers of development and accumulation (Swyndgedouw 2013). This recognition of Bangladesh as "disaster's homeland" both facilitates the acquisition of resources for and catalyzes the transformation of rural spaces into laboratories of adaptation.

Memoirs of 'The End of the World'

Much of the work of the adaptation regime, then, involves imagining what the future will look like, and that often has a dystopian quality (Swyndgedouw 2010). Khulna is the perfect place to carry out this work of imagination because many researchers and development practitioners already regard it as a sort of dystopia. "Munshiganj is the end of the world," said an American consultant hired by USAID to lead their flagship adaptation program in the Southwest, known as "CREL" (for "Climate-Resilient Ecosystems and Livelihoods"). I had just returned to Dhaka from a visit to the union of Munshiganj, home to several of CREL's "model villages." I interpreted this as a comment on the remoteness of this area. Munshiganj is the southernmost union of Khulna Division, considered widely to be the most vulnerable region of the world's most vulnerable country. The Southwest is cut off from Dhaka and the rest of Bangladesh by the Padma river; traveling there takes the better part of a day, involving a variety of different modes of transportation. Munshiganj in particular is where the road ends, bordered to the south by the Sundarban mangrove forest and to the west by India.

However, besides conveying remoteness, this statement reflects a deeper anxiety often expressed about the uncertain, risky, and dystopian future of the southwest. This anxiety is often marked by the imaginative geographies that Farbotko has characterized as "wishful sinking" (Farbotko 2010b). That much of this landscape is already experiencing an ecological crisis facilitates a vision of Khulna as climate dystopia, and the sense that it may even already be upon us. Climate change experts facilitate the imbrication of this region in the adaptation regime by circulating time-lapse maps of its coastline being inundated by sea level rise; these are among perhaps the most widely disseminated images of the country globally. Visiting researchers and consultants make day-long field visits to see settlements precariously perched on embankments (See Figure 18 and Figure 20). They accompany their accounts of these visits with photographs of erosion and post-cyclone cleanup efforts. These narratives offer a prophetic slippage between the present and future tenses of this climate dystopia, auguring the climate crisis that will come, or that may have already arrived. The imagination of Bangladesh's dystopic future has become "common sense"[41] (Gramsci 1971), by drawing on this imagery of the coastal region today. Yet, this ambiguity about Khulna's present and future dystopias allows for a spurious insinuation: that the challenges faced by coastal communities today are the direct result of climate change.

The texts produced by these field visits are semiotically rich, and both shape and are shaped by the way the region is understood in relation to climate change. One donor quipped to me that "there is not a single document in this country that does not start with 'Bangladesh is the most vulnerable country in the world to climate change.'"[42] His comment reflected not only the awareness of this sense of vulnerability, but also awareness of its hyper-proliferation. In addition to

[41] By "common sense," Gramsci refers to the practices of cultural hegemony through which the political and ideological status quo is perpetuated.
[42] On the performance of vulnerability in service of climate change adaptation, see Farbotko 2010a; Haalboom and Natcher 2012; Webber 2013.

the vast body of grey literature, visiting interns, journalists, consultants and others working in the adaptation industry produce a body of literature we might call *climate crisis memoir*, which appears in blogs, NGO websites, local and international English language press, and undergraduate and graduate theses.[43] In these memoirs, authors recount stories of desperate people whose homes they have visited, and who have most likely been displaced by some event that the author links to climate change. Stark photographs depict signs of ecological change, such as erosion, cracked earth, barren landscapes, absent explanations of local political ecologies or broader context.

Figure 18. A Reuters file photo published with a story on climate change in Bangladesh, depicting riverbank erosion. Source: (Islam 2016)

Among the more evocative climate crisis memoirs produced about Bangladesh can be found in two episodes of an Emmy-award winning television show called *Years of Living Dangerously*. In the show, celebrity hosts travel around the world looking at the impacts of climate change and the scientists who are confronting it. At the end of the first season, Michael C. Hall, star of the popular television show *Dexter* travels to Bangladesh, visiting slums in Dhaka as well as

[43] E.g. Oxfam 2010; Mifflin 2013; Voysey 2015; Derrington 2015; Kroodsma 2015.

villages in Khulna, talking with some of the country's foremost leaders in climate change and adaptation planning. Through these experiences, he explores climate change as a driver of a series of demographic, economic, and ecological concerns. He starts the first episode by giving us a tour of the *Dexter* film set, while he explains in a voice over:

> "Inside the air conditioned, air brushed world of Hollywood, climate change isn't something you have to think about too much, unless you really want to. But I know I am living in a bubble, and I know there are places outside my bubble where climate change is impossible to ignore. At the top of that list is Bangladesh, where I've heard that climate change is a matter of life and death."

After spending a couple days in Dhaka, he heads for Khulna, describing Southern Bangladesh as "the front line in this country's battle against climate change." Traveling around Khulna by boat and seaplane, with ominous orchestral music in the background, he tells us "I've heard people call Bangladesh a land of rivers. But that didn't prepare me for what I'm seeing. There's water. *Everywhere*." He is particularly intent on learning about climate migration, which we are told is causing Dhaka's growing slums to swell. He has a handful of conversations with people who have been displaced within rural communities, asking them questions about how cyclones and climate change have impacted their lives, and whether they think they'll be able to stay in Khulna. After visiting a family whose home had been severely damaged by river erosion and cyclonic winds, he reflects that "while these people may not want to leave, soon they may not have a choice… Seeing these remnants of people's homes makes it hard to grasp why they try to stay. Especially because all of this will eventually be under water."

Hall's interviews are punctuated by foreboding depictions of the deltaic landscape, implying links between what we're observing in the video images and climate change itself. At one point we are following behind him on a ferry, watching him look unnerved as he brushes his teeth, staring out at the river, while he tells us in a voice over,

> "As I make my way through Southern Bangladesh, what I'm seeing is hard to take in. Half-submerged trees. Houses built on stilts to keep them above the rising water. There's something apocalyptic and other-worldly about it all."

Figure 19. Michael C Hall in Khulna. Still from the television show Years of Living Dangerously

One might respond that the trees of Hall's dystopia are mangroves (half-submerged by their very nature), and building houses on stilts is a common feature of the region's vernacular architecture (Rashid and Ara 2015). These concerns would seem to be beside the point. Rather, Hall's depictions present us with a rich imagination of a dystopic future that the people of Khulna are already experiencing in the present. Their context beyond global climate change is immaterial to the narrative. The larger stakes of these threats become more apparent when he later interviews the then-US ambassador to Bangladesh, Dan Mozena, with whom he discusses the serious security threats posed by the climate refugees who will (and, in this frame, already are) pouring out of this

region. We hear that "Southeast Asia [sic][44] is already a politically volatile region. To understand how climate change could create even more conflict, just look at a map." Ambassador Mozena tells Hall that "A failed Bangladesh, a Bangladesh that has not adapted to the impact of climate change, a Bangladesh that implodes – that's a tremendous security risk to the region, and to *us*." Then the screen cuts abruptly to New York Times columnist Thomas Friedman interviewing Barack Obama about how the impacts of climate change in "poorer countries" are one of the greatest security threats facing the United States. The narrative arc of Hall's climate crisis memoir thus comes full circle in rendering America itself as the subject of these threats of climate change.

In another memoir, entitled "The Unfolding Tragedy of Climate Change in Bangladesh," published as a blog on the Scientific American website, Robert Glennon, a University of Arizona law professor, writes,

> "In some places, the impact of climate change is obvious. In others, scientists predict that climate change will occur based on elaborate computer models. In Bangladesh, it is already happening at a scale that involves unprecedented human tragedy. I witnessed this in December 2016, when I visited Bangladesh to give some talks at the University of Chittagong.
>
> *"December 9, 2016.* 'How do they survive?' I kept wondering as I walked the alleys of Old Dhaka, the capital of Bangladesh, a country with a population of 164 million on a landmass the size of New York State. People seem to be everywhere in Dhaka, in a churning frenzy of rickshaws, CNGs (Compressed Natural Gas Vehicles), taxis, buses, horse-drawn carriages and people—16 million and rapidly growing. The newest arrivals, mostly climate change refugees, end up in decrepit slums.
>
> "*December 18, 2016*. 'What will the sea do next,' I thought when I visited the remote village of Premasia, Bangladesh, at the junction of the Sangu River and the Bay of Bengal, south of Chittagong. The schoolchildren greeted us with spontaneous joyfulness, full of hope, despite the visible aftermath of Cyclone Roanu, which struck in May 2016, washing away homes and permanently ruining croplands from salt deposits. Their three-story concrete school, raised on stilts, served as a cyclone shelter during the storm. Isolated palm trees, now surrounded by water and beach, are haunting reminders that here once stood someone's home. Rising sea levels are turning land into sea bottom, driving some people farther inland. Others rebuild repeatedly, just as Sisyphus kept pushing the rock up the hill." (Glennon 2017)

[44] Bangladesh is located in South Asia.

Glennon's account of his visit to Bangladesh reflects a particular common literary device in these texts, in which the memoirist recounts their own speculative apprehension about the survival of the communities they have visited. This speculation reflects both a disquiet about the present living conditions of the community, as well as anticipation of crisis in an uncertain future.

Other memoirs highlight these anxieties about the coastal landscape alongside descriptions of the lives of the people who inhabit it. A sense that the people of the Southwest are merely being "kept alive," in the words of one donor, pervades conversations about the development of the region. "These people are doomed," their lives are "shit," in the words of others. "You get this grim feeling that they have no future," explained one researcher to me, about her visit to Khulna, "you just think 'you guys are fucked.'" These comments convey a sense not only of future threats, also the notion that Khulna is already a kind of dystopia. What they elide is the assumptions about what exactly it is that makes the lives of Khulna's inhabitants so "shitty" (a word I heard repeatedly in this context throughout my fieldwork). While the threat of rising waters is usually at the forefront of these kinds of reflections, they often blend into more nuanced descriptions of the experts' own imaginations of the challenges of rural livelihoods – that it is not only climate change, but the difficulties of the agrarian livelihood in Bangladesh generally that make these people's lives miserable. The "backbreaking" work, in the words of one official from the UK's Department for International Development (DFID), of being a farmer in the remote, hot and crowded swamp that these people call home is a cause of great concern for many development practitioners and other visitors. Their comments articulate a broader assumption that climate change adaptation experts working in Bangladesh express repeatedly. That is, that the objects of their adaptation programs are people who have no hope, and are living on the brink. They are people who are in need of alternative pathways out of their current lives and livelihood conditions, and that these are

pathways that development agencies are uniquely positioned to provide. The realities of climate change are in many ways incidental to this imagination of desperation and need for development.

Fundamental to these perceptions of agricultural livelihoods is a linked assumption that farmers do not want to continue being farmers, and that climate change adaptation therefore offers them an opportunity to move out of agrarian livelihoods. At a public lecture entitled "Addressing the Climate Challenge in Asia: Role of Finance ++," Dr. Bindu Lohani, the Asian Development Bank's (ADB) Vice President for Knowledge Management and Sustainable Development addressed this directly in response to how the ADB thinks about population and land issues. He said, "Who is going to do farming? The sons of farmers don't want to do it. They have the same aspirations as you and I! Agriculture will have to be looked at totally differently. In the future, we'll look at the farmers instead as the CEO of the farm." Indeed, Lohani's assumption that farmers have the same aspirations as a room full of donors and development practitioners is foundational to the discourses of the adaptation regime. Testimonies from farmers in Khulna examined in Chapters 5 and 6 controvert these assumptions, indicating continued aspirations to agricultural livelihoods.

These memoirs construct climate misery as an object of development, serving to justify development interventions in the name of adaptation. They operate as memoirs not only in the sense of biography, but also in the sense that they memorialize an anticipated loss of life, an anticipation which is an artifact of their own design. The memoirist becomes the subject of the narrative, with the residents of the coastal region serving as their object. What is most troubling about the narratives is their incongruence with the stories of the residents themselves about the complex historical and contemporary dynamics shaping their communities. Climate crisis narratives often suggest, either directly or obliquely, that residents don't understand the changes re-shaping their landscapes. One memoirist wrote, "climate change is the buzzword of the decade, and yet the very people who live on the coasts of Bangladesh, directly impacted by global

warming, rarely understand the term" (Khanom 2016). On the contrary, my own ethnographic research suggests that not only can most residents of these communities supply a clear scientific description of climate change and its global geopolitics, but they can also offer a detailed, nuanced perspective on its articulation alongside a range of other dynamics shaping the region's pasts, presents, and futures.

Figure 20. Photo of riverbank erosion in Bangladesh. Source: (Braasch 2005)

Defining Climate Hotspots

Adaptation regimes define the geographic scope of projects, mapping which interventions are possible or desirable where. Extensive reference to and analysis of climate "hotspots" infuses discussions of the areas that should be prioritized for research and intervention. In Bangladesh, the southwest is universally identified as a hotspot, owing to its vulnerable location in the delta as well as on the coast (BRAC 2013; RMMRU and SCMR 2013; CDMP II 2014; de Heer 2014; COAST

2015). Sometimes the identification of a hotspot is based on “expert opinion,” meaning that if development practitioners involved in adaptation interventions say that a place is a hotspot, then that makes it a hotspot (Kabir, Jahan, and Chowdhury 2015). Identification of which areas are more “hotspot” than others can also involve complex methodologies, sometimes employing advanced mathematical equations, producing detailed rankings and maps. One researcher, presenting findings from one such study, explained in June 2015 that "Deltas are hotspot. But within the delta, some areas are much more hotspot.” Determining factors are primarily physical, reflecting vulnerabilities to salinity, erosion, storm surge, and fluvio-tidal flooding, which are considered static ecological conditions.

Yet, "adaptive capacity," a category intended to reflect social dynamics, is also often considered a factor in determining hotspots. In the “hotspot” study mentioned above, the indicator of “adaptive capacity” was road density, which the researcher explained could be considered a proxy for market access. Khulna’s remote but relatively dense road network has expanded over the past several decades along with the rise of shrimp aquaculture. Community members say that expansion of the road infrastructure is linked with the shrimp industry, because shrimp requires relatively quick transport to processing facilities to prevent spoilage (Salam, Ross, and Beveridge 2003).[45] Thus, if Khulna’s road density can be understood to correlate at least in part with its expanded shrimp industry, then its “adaptive capacity” is also closely linked with its shrimp industry. In this sense, Khulna’s hotspot status is rooted not only in its coastal geography, vulnerable to saline intrusion and cyclonic storm surges, but also due to its growing integration into the national export economy through the production, processing, and transport of shrimp. Khulna’s perpetual hotspot status thus reflects the epistemic and normative dimensions of defining

[45] As a point of comparison, the roads in Polder 22 (where they have never cultivated shrimp commercially) are unpaved, whereas the roads in every surrounding polder, where shrimp cultivation is ongoing, do have paved roads.

climate hotspots. Khulna is a hotspot not only due to its current and projected geophysical characteristics, but also due to the imagined expansion of capitalism throughout its rural coastline.

Experimentation

"Bangladesh is the experiment for the future of the world." – Senior administrator at a major rural development agency in Dhaka, 2 April 2014

Much of the enthusiasm among adaptation experts in Bangladesh is centered on the successful transformation of the coastal zone into a "laboratory" in which innumerable experiments can be carried out to test what adaptation to climate change might look like (cf. Knorr-Cetina 1992; Tilley 2011; Hennessy 2013). One expert explained that Bangladesh is "the place where the rest of the world comes to learn how to tackle climate change." Consultants, planners, and researchers celebrate the development of Bangladesh as a landscape of "innovation," where the very fact of destruction creates opportunities for experimentation with new ideas and technologies. As the idea of Bangladesh as "adaptation laboratory" is developed and celebrated by foreign and Bangladeshi adaptation experts alike, it becomes clear that this success has less to do with the promise of any particular intervention or set of interventions, than it does with forging a landscape of experimentation. These interventions are thus considered successful as experiments even when they participate in the production of crisis.

To catalogue potential adaptation experiments, NGOs and research organizations have begun to compile “inventories” and “checklists” that list a wide range of technical interventions that they have identified as possible responses to climate change, available for replication in climate-vulnerable communities around the world.[46] Inventories are documented in reports and spreadsheets which are circulated among various agencies and presented in seminars in Dhaka.

[46] See also Bassett and Fogelman (2013).

Some examples include an (unpublished) Adaptation Technologies Matrix developed by the Asia Pacific Adaptation Network, a table of "Adaptation Measures" published in the USAID report, "Adapting to Coastal Climate Change" (USAID 2009), and a Climate Change Adaptation Inventory developed by the "DEltas, vulnerability and Climate Change: Migration and Adaptation" (DECCMA) project, a consortium of researchers from Bangladesh, India, Ghana, and the UK. The latter, among the most robust iterations of such inventories, contains 122 "documented examples of observed adaptation" from Bangladesh, India, and Ghana, including "any choices or adjustments to climate variability and change. These adjustments may be in response to, or in anticipation of, real or perceived climate stressors" (Tompkins et al. 2017, 5). At a "Dissemination Workshop" for this inventory in Dhaka in 2015, researchers explained that they had identified possible adaptation options for the inventory using keyword searches for both academic and grey literature in Google, Google Scholar, Academia.edu, and other academic databases. In this way, potential adaptation strategies come to be understood tautologically as any actions that someone has already called adaptation strategies. At the workshop, researchers noted that they had confronted an analysis problem that some adaptation options are considered successful by some but unsuccessful by others. All adaptation options made their way into the inventory, regardless of this interpretive analysis. What the inventory also misses are any ways that people navigate their changing environment that are not referred to as adaptation strategies.

In an exemplary demonstration of such inventories, the NGO WorldFish created a "Climate Smart House" for a single family in one coastal village (see Figure 21). Raised up on concrete stilts, the Smart House is stocked with technical fixes to match every climate-induced problem WorldFish could imagine, from the "sanitary" latrine on the roof to the rain-fed fish tank underneath (Hossain, Nurun Nabi, and Kaminksi 2015). When I visited the Climate Smart House, its residents generously gave me a tour of its many features, most of which were in various stages

of disrepair. One WorldFish staff member a colleague and I interviewed in Dhaka in December 2014 noted, however, that "it's not for community replication, it's for the donors," continuing that it exists now principally "for the website." I interpreted this to mean that the power of the Smart House is more ideological than material, to the extent that it served as a demonstration of possible modes of experimentation, ideally to garner additional funds for future projects to be implemented by World Fish itself. It is in this epistemic sense that the Smart House serves the adaptation regime.[47]

Figure 21. An image of the Climate Smart House from WorldFish promotional materials. Source: (WorldFish 2014)

Some NGOs are developing adaptation "technology parks," where assemblages of possible interventions are collected and modeled (e.g. Siddique 2015). In describing one such park (and inviting me to visit), a European consultant responsible for developing the project explained in

[47] On the Climate Smart House as a spectacle of securitized visions of climate futures, see Cons ND.

June 2015, "we have the space to play around, and to invite other organizations to play around with us." Sexy high-tech experiments like "geosynthetics" (polymer sheets used to stabilize eroding coastlines) and "ultra-violet disinfection" (used to purify drinking water) sit neatly alongside more systemic interventions such as coastal zoning and saline aquaculture expansion. Adaptation becomes common sense through this proliferation of interventions and the selection, appropriateness, and geographic targets of interventions begin to appear self-evident. An adaptation expert at one UN agency explained to me in March 2015, when I asked her about the scope of their work on climate change, "we don't define adaptation, we just implement adaptation projects." It is through the adaptation regime, then, that the interventions that can be considered "adaptation projects" are determined, and adaptation is rendered technical (Li 2007). In this way, adaptation is pursued devoid of a political analysis of the multiple possible futures that any particular intervention or selection of interventions may promote (Grove 2016).

These geographies of experimentation are managed through the spatial governance of interventions by various development agencies. One World Bank consultant shared with me a map of the coastal region that he said was replicated in almost every internal report or proposal circulated within and among development agencies conducting adaptation work in the coastal zone (See Figure 22). The map depicts a color-coded diagram of all of the 57 polders of the southwestern region highlighted in various neon shades, with a key indicating which polders had been claimed by which development projects, and which were "available" for new proposed experimental interventions. The map recalls those produced at the Berlin Conference during the Scramble for Africa, as do frequent comments by representatives of various agencies referring to their project sites in the possessive case (e.g. "that's one of *our* polders").

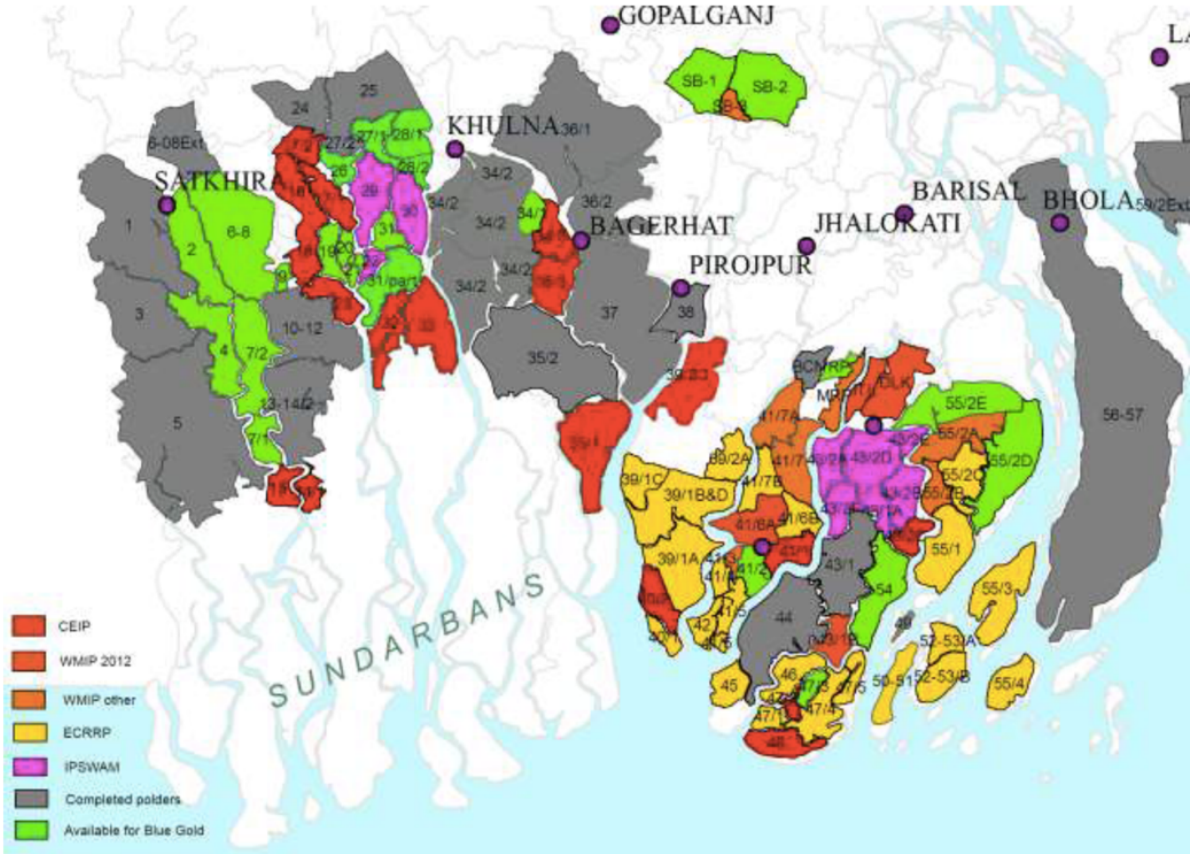

Figure 22. Map of distribution of development interventions across polders by agency. Source: (Blue Gold 2012)

The threat and discourse of the dystopic future of the southwest becomes both rationale for experimentation and excuse for its failures. The spatial imaginary of a landscape that is already on the verge of annihilation allows planners to treat the southwest as an adaptation *tabula rasa*. One donor discussed this approach as a policy of "no regrets," suggesting that if the landscape is going to be destroyed anyway, or is not "worth" saving, then there can be no regrets in conducting experiments with uncertain and potentially destructive results. When it comes to the expansion of shrimp aquaculture, practitioners contend that any production in a landscape that they deem to be on the verge of collapse is a success of adaptation (in the absence of any alternative possibility for comparison). If shrimp aquaculture takes the place of rice agriculture (and the livelihoods and communities that are dependent on it), then the idea that the latter is not viable, or will not be viable in the near future, reframes this dispossession as a fortuitous bonus.

One manifestation of this landscape of experimentation is the constant dissemination of information through "evaluations" of NGO development projects, a body of knowledge production that exists in its own methodological and epistemic plane (see also Ferguson 1990). When it comes to climate change adaptation, these evaluations often serve to demonstrate more that an experiment was conducted, rather than any particular result it may have garnered. Adaptation options are produced for the sake of "demonstration," a category that indicates an experiment sitting outside of any particular social context. The problem is that many such experiments are exactly just that - experiments. The administrator of one UN agency described to me his frustration with the discrepancy between a small "test plot" with a signboard in English and a technology that "actually works" in the field and that farmers are adopting. Throughout rural Bangladesh, seemingly every possible space, from drinking wells and convenience stores to many agriculture and aquaculture fields and fertilizer factories, are dotted with such colorful signboards emblazoned with conspicuous logos indicating the NGOs that have implemented and the donors that supported the project (see Figure 23). That these signboards are frequently printed in English, a language unlikely to be read fluently by a single resident of any given Bangladeshi village, indicates their function as symbols for donors on site visits (or for pictures for promotional websites, as one NGO staff member pointed out to me). However, this administrator explained to me that particularly in the case of agricultural adaptation experiments, the results of these test plots are often much better than they are if and when farmers implement them in their own fields. "We're promoting or pushing technologies without really understanding what's going on," he remarked to me. It is precisely, then, the role that such projects perform in shaping the geography of experimentation that constitute them as adaptation strategies.

Figure 23. Examples of NGO signboards with donor logos in Khulna

Dispossession

The discourse of Khulna's dystopic future often begins and ends with a question, articulated succinctly by one World Bank administrator: "is it even worth keeping people there?" Of course the answer to this question is deeply normative. Who gets to ask a question like this, and who gets to answer it? And what happens if the answer to that question is negative? These speculative calculations and the results of responding to them reflect a process of dispossession in the adaptation regime.

Garments, Shrimp, and Dispossession

Thanks in no small part to the significant presence and role of international donor agencies in Bangladesh, the official discourse and paradigm of development in Bangladesh since the 1980s

has strayed very little from neoliberal development orthodoxy. This synergy is illustrated by the government's own "Vision 2021," an election manifesto of the ruling Awami League party promising that Bangladesh will become a "Middle Income Country" by the year 2021, the 50th anniversary of the country's independence. Vision 2021 has become a mantra of both government officials and donors, promising that Bangladesh will become “the next Malaysia” (Mozena 2014; Hasina 2015). This vision represents a mandate for export-led growth and accompanying social and economic transitions. For the World Bank, achieving this vision will require a concerted transition of Bangladesh’s labor force into the non-farm sectors (Muzzini and Aparicio 2013; Path to middle-income nation 2014; World Bank 2014a).[48] The World Bank’s 2013 World Development Report singled out Bangladesh’s export garment sector for contributing to an urbanization rate of 30 percent, double the rate in 1980 when the garment sector was still in its infancy (World Bank 2012, 197). The sector has grown from an annual export value of US$300 million in 1983 to US$10.7 billion in 2008 (Mottaleb and Sonobe 2011, 70), and today accounts for more than three-quarters of all exports from the country (World Bank 2016, 36).

Yet, the growth of the frozen shrimp export industry is also central to this vision, both in its contribution to export diversification, as well as its role in transforming the agrarian economy. This export-led vision of market growth sees shrimp as contributing to Bangladesh’s economic autonomy, as reflected in a slogan outside the Fisheries Department compound in Khulna, translated to “an autonomous Bangladesh cultivates more fish” (see Figure 24). With shrimp exports valued at US$550 million in 2014, it is the fastest growing agricultural sector, with an average expansion of 6.2 percent annually between 2011-16 (Ovi 2014; World Bank 2016). It is seen as critical to the expansion of “non-crop agriculture,” which the World Bank regards as a more productive sector, and therefore necessary to the growth of Bangladesh’s economy (World

[48] In 2015, 66% of the population was rural, down from 95% in 1960 (World Bank, 2017).

Bank 2016). Between 1984 and 2015, the area under shrimp and prawn cultivation in Bangladesh grew from 64,246 ha to 275,274 ha (Pokrant 2014; Belton 2016).

Figure 24. Slogan outside the Fisheries Department in Khulna.

Relatedly, and perhaps more importantly, the "productivity" gains garnered through the growth of shrimp aquaculture have precipitated significant rural-urban migration (Adnan 1993; Datta 2006; Paprocki and Cons 2014; Pokrant 2014; Belton 2016).[49] This availability of a

[49] Reliable demographic statistics for migration from Khulna are difficult to ascertain largely because of the wide variety of both formal and informal migration patterns, including both circular and permanent out-migration. For example, while ethnographic evidence clearly indicates significant migration to India, the Bangladeshi government officially denies this migration flow, owing to the contentious border politics between the two countries. One foreign researcher told me that he and his team knew from their surveys in Khulna that there was significant out-migration and they suspected many of these migrants were going to India, but in the absence of cross-border demographic study, they couldn't tell how many. Two other Bangladeshi researchers from different research institutes told me that their organizations had survey data indicating significant migration from Khulna to India, but that they would not publish this data because of

seemingly endless supply of cheap migrant labor from rural areas has contributed to the vigorous growth of Bangladesh's garment industry (Siddiqi 2000). As one World Bank report explains, "improving rural productivity by modernizing agriculture and diversifying nonfarm activities, in order to free up manpower for use in more productive activities, is also essential for growth" (Muzzini and Aparicio 2013). The transition from rice agriculture to shrimp aquaculture has motivated a loss of agricultural livelihood opportunities, contributing to this process of "free[ing] up manpower." Precise figures are unavailable due to the diversified and seasonal nature of agrarian livelihoods, though respondents interviewed estimated that shrimp cultivation requires somewhere between 90-99 percent less village labor as that of rice cultivation (these numbers are explored further in Chapter 5). Moreover, this transition also accounts for the loss of other economic and subsistence activities, such as poultry and livestock rearing, native fish culture in homestead farms, homestead fruit and vegetable cultivation, and gathering of cooking fuels (Datta 2006). These losses are largely due to rising soil salinity resulting from long-term shrimp aquaculture, with the salt from *ghers* steadily encroaching into homesteads, making even land left for small garden plots largely infertile (see Figure 25).[50] In this context, the question cited above of whether it is "worth keeping people" in villages in Khulna is inflected not only by the awareness of the certain and uncertain threats of climate change, but also by an existing political economy of development that is driving dramatic social, ecological, and demographic transitions. Indeed,

the aforementioned politics between the two countries. The Bangladesh Bureau of Statistics in their 2016 study of international remittances reports that Khulna received the lowest average remittances in the country, but among the rankings of countries from which migrants send remittances back to Bangladesh, India is not even listed (BBS 2016a). However, the net population decline in Paikgachha reported between 2001 and 2011 (from 249,000 to 248,000) suggests that shrimp farming is contributing significantly to rural out-migration (BBS 2016b). I examine further the politics of knowledge about out-migration from Khulna in Chapter 4.

[50] These findings are confirmed by the author's own research, as well as Datta (2006), among whose respondents 90.7% cited decreases in vegetation due to shrimp cultivation.

shrimp aquaculture drives agrarian dispossession whether it is promoted as a climate change adaptation strategy or otherwise.

Figure 25. Shrimp ponds in Khulna

Promoting Migration

It is in this context that the discourse of migration as a strategy for climate change adaptation has emerged. Through the adaptation regime, climate migration has been embraced as an opportunity for a particular vision of development in the coastal zone and the country in general. This emerging vision of migration as adaptation is not unique to Bangladesh (Tacoli 2009; Farbotko 2010b; Felli and Castree 2012). Linking visions of uninhabitable rural spaces with those of the economic opportunities offered by migration, this narrative proliferates both through discourses surrounding climate refugees, as well as particular development strategies carried out in

the name of adaptation (Hartmann 2010). This narrative is embedded with the fundamental assumption that people living in coastal communities in the southwest don't want to remain where they are and that migration is desirable.

Many donors have developed programs that aim to promote this idea directly. At one event in April 2014 at a large, frigidly air-conditioned hall in Dhaka, approximately 50 representatives of major donors, NGOs, research and government agencies gathered to discuss the advantages of such an approach. Each attendee was greeted at the door with a complimentary coffee mug bearing the words, in bright green and red: "LIVELIHOOD MIGRATION: Not a threat, A tool for climate change adaptation." During the seminar, a film was screened featuring interviews with men who had moved from the southwest to Dhaka and were working as rickshaw pullers. One of the men interviewed pled to the camera (in Bengali), "I pray to God that I am able to go back to my village and farm again." That this statement contradicted the upbeat message the organizers were trying to convey seemed to be lost on most of the workshop's attendees. An official from DFID, commenting after the film ended, discussed the need for greater recognition among donors and government agencies of the "Climate Change Migration Dividend." By this, he explained he meant the benefits to national development of creating a workforce of people who have migrated out of climate change affected areas, into urban areas where they can participate in the industrial, export-oriented economy. This understanding of the development potential of climate migration is embraced by the Bangladeshi government in addition to the donor community; the 2009 Bangladesh Climate Change Strategy and Action Plan, citing the impending displacement of 20 million people in the near future, explained that “migration must be considered as a valid option for the country. Preparations in the meantime will be made to convert this population into trained and useful citizens for any country” (MoEF 2009, 17). The implication of the government (here

diverging from most donors) is that countries of the Global North must accept migrants from Bangladesh who are threatened by the impacts of climate change.

This Climate Change Migration Dividend theory reflects the growing discourse within the adaptation regime that agrarian dispossession is both inevitable and desirable. An executive at another large international donor agency funding climate change adaptation programming in Bangladesh explained to me during one of his brief visits the potential he saw in the contemporary moment in Bangladesh to shift away from the logic that he had observed in his career, which had previously focused on rural development, meaning improvement of rural livelihoods *in situ*. He contrasted this view with a more recent movement that he saw as grounded in the acceptance of the risks of climate change, coupled with a recognition of a broader fundamental and inevitable rural to urban economic transition. He explained that his own interpretation of the need for climate migration had more to do with the desires of rural inhabitants to relocate because they would prefer an urban livelihood. He explained,

> "There are a lot of people moving because it [life in rural communities] is absolute shit and they want to get out of it. If you look at it economy-wide, and sort of, you've got to stand back and look at the demographic transition that's occurring in any country, I don't mean the population, I mean the transition of the economy from a rural to an urban one is something that's happening and will go on happening."

This comment reflects the synthesis of an awareness of the impacts of climate change with a normative perception of the value of agrarian livelihoods in a rapidly transforming economy and ecology.

The donor continued by expanding on the role of experts in promoting this transition away from an agrarian economy, "I do think that when you're working on climate change, it's about trying to introduce that vision of what the future will look like." This comment suggests the broader function of adaptation experts in securing the hegemony of the adaptation regime. The regime itself is contingent on the articulation of Khulna as a space without a future. To that end, many

donors have developed programs to support off-farm employment and urban development as key components of their climate change adaptation portfolios. Some examples of programs cited by donors and NGOs for off-farm employment generation include training in rickshaw repair, garments manufacturing, and shrimp value-chain work (such as shrimp net building and assembly line processing). One researcher described this work as part of a broader vision to develop "alternative mega-cities" in Bangladesh to which migrants can transition, explaining that “Khulna has the potential to become a huge mega city” because of its port and the Special Economic Zone (PowerPac) in nearby Mongla. The expansion of major export processing zones in peri-urban areas throughout the country is seen as a necessary step in this planned urbanization.

While public discussions about the use of migration as an adaptation strategy focus on the benefits of these urban and peri-urban transitions, in private many donors speak more openly about what they consider the necessary dispossessions in rural communities that will effect such migrations. For example, a representative of USAID's largest adaptation program explained that the approach of their work is to get people to move away from their rural communities (as opposed to supporting sustainable development within them). Another donor representative discussed the ways in which their "resilience" approach was fundamentally at odds with a rights-based approach, which insists that people have a right to stay in their homes, describing this alternative approach to resilience as a "brutal" but necessary logic. To that end, he asked "why are we going on investing in these places without a hard-nosed analysis of whether these places are worth saving?" This, then is the explicit articulation of the implicit assumption of the necessity of dispossession to the adaptation regime. That is, that rural livelihoods will play a diminished role in the future of development under climate change.

Indeed, many practitioners focus directly on the role of these migration patterns in promoting development in Bangladesh. One member of a panel on climate migration at a

conference on climate change in Dhaka in 2015 described development policies that help people to stay in their communities of origin as a "policy disaster." She continued,

> "Voluntary migration of some members of the family should be used as a tool for climate change adaptation. If we are too romantic in thinking about helping people to stay in their places of origin, then we are trapping them in chronic poverty… One has to think *big*. Instead of looking at migration as a problem of urbanization, we need to recognize that development will never happen if we don't encourage migration."

As this declaration of the benefits of climate migration highlights, despite the trauma implied by dystopian imaginations of climate change in southern Bangladesh, experts I spoke with were surprisingly sanguine about the future. Even as it draws attention to the catastrophic potential of climate change, the adaptation regime proposes that the crisis of climate change should be treated as an opportunity. The notion of turning threats into opportunities has virtually become the mantra of the adaptation regime. This is a foundational logic in many proposed climate change adaptation strategies. It is a strategy that closely resembles what Naomi Klein calls *disaster capitalism:* "orchestrated raids on the public sphere in the wake of catastrophic events, combined with the treatment of disasters as exciting market opportunities" (Klein 2008, 6). Klein situates disaster capitalism more broadly in relation to neoliberal capitalism, in particular the intensified post-9/11, post-Katrina neoliberalism that is marked by a sense of uncertain but perpetual crisis (see also Gotham 2012; Adams 2013).

In Bangladesh, the notion that those rural livelihoods most vulnerable to climate disaster are already obsolete facilitates this focus on the opportunities that are opened up via climate change. Experts express (to one another, at conferences and meetings, and in newspapers and other public fora) the need to be "positive" about the potential benefits that can be derived from climate change, not to be afraid of change or of experimentation, and, indeed, to have the "courage" to do so. The discourse of "opportunity" shifts the focus onto the positive impacts of the

inevitable destruction that will take place due to climate change, reframing dispossession as progress.

Conclusion

The adaptation regime reshapes Khulna's social and physical landscape through a dialectical exchange between, on the one hand, material interventions in the landscape and the communities which inhabit it, and on the other, the epistemic construction of the limits of possibility for its future. Practitioners wield the threat of a future dystopia under climate change while at the same time responding to a contemporary rural political economy characterized by a state of development which they already regard as dystopic.

To return, then, to the parable with which we began at the Paris climate conference, development practitioners who celebrate "deep structural transformation of economies" are the actors who perform the work of imagination, experimentation, and disruption that constitutes the adaptation regime. The village whose inhabitants will be "working in a garment factory down the road" is the landscape upon which the work of the adaptation regime is imagined and performed. Perhaps their rice paddies have given way to shrimp ponds, or the embankments protecting them have been torn down, and the land has disappeared altogether. Yet the geography of this adaptation regime is not restricted to these villages. Much of the work to forge the regime itself takes place far from Bangladesh's coast – in Paris, Dhaka, and elsewhere. It is through the dialectical exchange between the ongoing transformations of the coastal ecology and the epistemic rendering of what its future can and should look like that the region itself is transformed.

CHAPTER 3

ALL THAT IS SOLID MELTS INTO THE BAY: ON ANTICIPATORY RUINATION

The shaping of Khulna as a zone of climate crisis through the adaptation regime is an active and ongoing process, involving both epistemic and material dynamics. The mobilization of shrimp aquaculture in this landscape as a tool for climate change adaptation is integral to the dynamics of what I call *anticipatory ruination*, a discursive and material process of social and ecological destruction in anticipation of real or perceived threats. I use the concept to explore not only the dynamics taking place in Khulna in particular, but also the ways in which climate crisis is dialectically constituted (epistemically and materially) more generally. While anticipatory ruination is an important dynamic of how the adaptation regime is manifested in Bangladesh, either might occur independently in other contexts.

My understanding of ruination draws on the work of Ann Stoler and contributors to her volume *Imperial Debris* (2013), who explore ruination as an act, condition, and cause, each with its own temporality. As Stoler writes, "*ruin* is both the claim about the state of a thing and a process affecting it. It serves as both noun and verb" (Stoler, 11). Turning to ruination as a verb, as opposed to an analysis of ruins as inert objects, denaturalizes the dynamics of destruction: who is the agent of ruination? How, why, and when does it take place? Thus, examining ruination as an ongoing process is to investigate claims of drivers of dispossession as remote, inevitable, or complete. Stoler and colleagues also direct attention to the historical dimensions of ruins, not as dead material artifacts of destruction, but as ongoing political projects that continue to have real effects, linking the exercise of power in past and present. As such, I understand anticipatory ruination in Khulna as an ongoing act with both histories and futures, that links climate change to the longer ecological history of this region: to shrimp production, land use changes, and visions of adaptation and inevitable displacement. Understanding ruination in this context is to question the notion of

climate crisis as a spatially or temporally distant possibility - rather, to understand it as one that is actively produced in particular places through modes of power that operate at multiple scales.

Moreover, I draw on a growing literature that examines new forms of governing through analysis of the politics of *anticipation* (Adams, Murphy, and Clarke 2009; Amoore 2013; Anderson 2010; Braun 2015; Cross 2014; Zeiderman 2016). This literature understands *anticipation* as a key technology of policing in a new world of increasingly securitized governance (Stalcup 2015), and identifies ways in which anticipation precipitates certain forms of violence. Anticipatory ruination itself is entailed in sociotechnical imaginaries which "elevate some imagined futures above others" (Jasanoff and Kim 2015).

In Khulna, shrimp cultivation has not only resulted in social, economic, and physical dispossession of many of the most vulnerable members of rural communities, but it has also produced ecological degradation that visually invokes quite literal ruination. In an interview I conducted with one donor in Dhaka, she compared the landscapes that are produced by this degradation to T.S. Elliot's wastelands. The salt hanging in the air leaves a faintly dry and sticky residue on one's skin. The feeling of ruination in this space, irrespective of an analysis of its drivers and histories, is inescapable. These dynamics of degradation and dispossession through shrimp production in Khulna will be explored in greater detail below. The continued centrality of shrimp, through the shifting development landscape from the structural adjustment of the 1980s to the contemporary focus on climate change adaptation illuminates the broader context of anticipatory ruination in this region.

Climate change adaptation in Khulna involves an imagination not only of the opportunities embedded in the expansion of shrimp aquaculture, but also the erasure of other possible futures. Shrimp production becomes an opportunity as other modes of production are imagined as unviable. The transition from rice agriculture to shrimp aquaculture is rendered inevitable through

anticipatory ruination of the modes of production and social reproduction through which communities in this region have historically sustained themselves. As Stoler writes, "ruins draw on residual pasts to make claims on futures. But they can also create a sense of irretrievability or of futures lost" (Stoler 2013, 21). The sense of inevitable crisis thus dialectically anticipates and produces ruination.

While my examination of anticipatory ruination is firmly grounded in Khulna's particular historical and political geography, its reach extends much more broadly. To better understand the broader dynamics of anticipatory ruination through climate change adaptation that I explore in Khulna, I extend my ethnographic scope to international discourses on new modes of development decision making in the time of climate change. I thus examine the dynamics of anticipatory ruination at multiple scales. I begin with an exploration of the work of anticipatory ruination and the discourse of climate crisis at a global scale, examining the implications of generalized global adaptation decision making models to coastal Bangladesh. I then investigate the process of imagining the future of Khulna by donors and development practitioners in Dhaka, then focus in on the particular dynamics of how this imaginary is carried out through shrimp aquaculture in rural communities in Khulna. Finally, I extend the temporal scope to an emerging proposal for planning and enacting this ruination in the region more broadly. Collectively, these explorations illuminate how the logic of anticipatory ruination works, as well as how that logic is manifested in a particular place. By shifting between temporalities and geographic scales, I thus explore how the anticipation of the future actively shapes the politics of the present.

Robust Decision Making

In the fall of 2014, I observed these dynamics clearly at a conference in Rotterdam, "Deltas in Times of Climate Change," hosted chiefly by a group of Dutch government, private, and

research agencies. In one workshop, a Senior Economist with the World Bank's Climate Change Group used a board game called "Decisions for the Decade" commissioned by the World Bank and the RAND Corporation to demonstrate a decision making tool they developed known as "Robust Decision Making."[51] The World Bank and RAND encourage policy makers to use this tool in contexts of "deep uncertainty,"[52] such as climate change. The board game is intended to demonstrate to participants how decision makers identify "robust options" for investments which are less precarious in the context of uncertainty. The goal is not only to shape the way that decisions are made, but to structure understandings of the future that will shape different kinds of decisions.

Participants in the workshop, a variety of NGO development practitioners, researchers, and government civil servants primarily from Europe, Africa, and South and Southeast Asia, gathered around tables in a large conference room at Rotterdam's World Trade Center. We were given game boards and handfuls of beans and red pebbles as the economist explained the rules. We were told that our role in the game, representing provincial governors and national policy makers, was "to create a prosperous province and nation," which is sought in the game through decisions between investments in development or flood and drought protections. In the context of the game, these decisions are based not on information about the the fictional communities to be protected, but on anxiety about the risks and potential outcomes of the random roll of the dice. As we began, the World Bank economist encouraged eager game players, irreverently quipping, "let's reward the winners, but also shame the losers!" Faulty decisions produce natural disasters, or

[51] The game itself was developed by the Office of the Chief Economist of the World Bank in collaboration with the Red Cross/Red Crescent Climate Centre, with additional support from the German development agency GiZ (Suarez et al. 2015).

[52] I examine the politics of uncertainty in Bangladesh in greater detail elsewhere, but suffice it to say that the mobilization of uncertainty is not incidental to the work being done here. Architects of Robust Decision Making trace their attention to "deep uncertainty" back to Frank Knight, a founder of the Chicago School, whose "Knightian Uncertainty" differentiates economic risk from uncertainty, proposing that the latter is essential for profit (Hallegatte et al. 2012, Knight 1921, Lempert, Popper and Bankes 2003).

"crises," determined by a random roll of a die, dubbed the "probability density function."[53] In each round, ersatz provincial governors for whom the "probability density function" produced a "crisis" were made to stand up from their seats and announce animatedly to the room: "Oh No!" In an online video about the use of Decisions for the Decade and associated games developed by the same group, one player describes this moment in game play, “all of a sudden a flood hit. And I died. So… Well, I was washed away to a local slum town and have been subsisting off of leftover banana peels and whatnot.” As this glib takeaway highlights, the point of the game is to allow players to imagine the kind of profound ruination from which there is no return. The player knows that their decision-making failure has resulted in an unspecified dystopic future (in which dying and living in a slum are equated, but the distinctions between them are immaterial). In the context of the game, this anticipation is pervasive – unless the player chooses the “robust option,” the threat of ruination is always present. Moreover, the anticipation of this ruination is understood to exist without geographic boundaries. Notably, the “provinces” we represented bore no signs of any particular place. Indeed, we were supposed? to imagine that they might stand in for any given province anywhere in the world. Likewise, the game sought to help us comprehend equally boundless decision-making tools, intended to be applied universally, without specification.

In the second round, a twist was introduced: instead of making decisions between standard investments in development and protection, players were offered a "robust option," by which their investments would be protected from any climate-based variability. The economist explained, "Say you can invest in something, for example, industry, that would guarantee [returns] without any risk of flood or drought." So there it is, the robust option: industry. It's not vulnerable to droughts and flooding, unlike antiquated investments in things like agriculture and coastal embankments in rural

[53] Though this term seemed to be used somewhat ironically here, presumably it was also a reference to the need for mathematical modeling tools that offer planners logical, evidence-based solutions.

areas. The economist lamented that robust options are expensive, and "not easy," presumably a euphemism for their unpopularity with the fictitious constituencies of the game players. He exhorted sympathy (is this tongue-in-cheek?) for the "poor World Bank that needs to hand out all the money for all these development projects to make it all robust." Game players were inclined to agree with him, then, when he chided those investing heavily in protection that "you're pointing your countries on a less prosperous path!" By the last round of the game, when the standard die was replaced with a floppy piece of paper taped together, labeled "the cone of uncertainty," (apparently intended to represent the enhanced and profound uncertainty of the future under climate change), players already understood the moral. That is, ruination in the future will be inevitable; it will be necessary to make decisions that anticipate this ruination; these decisions may involve a normative shift in values, and will radically change landscapes.

Decisions for the Decade thus facilitates the kind of "magical vision" (Tsing, 133) that conjures the empty, exposed space required for making decisions that appear neutral and rational. Robust options are appropriate to this new dynamic of anticipatory ruination, for landscapes which do not yet exist, but will. The economist explained that he and his World Bank colleagues play this very game with policy makers all over the world in order to instill these same feelings of deep uncertainty and encourage reflection on Robust Decision Making. Such tools are intended to help policy makers determine appropriately robust decisions, involving quantitative, long-term policy analysis, and the use of modeling software to generate possible scenarios of this uncertain future.

What the board game and the discussion of the Robust Decision Making model mask is the profoundly normative nature of these decisions and the discussions informing them. They present decisions as technical where they fundamentally involve the devaluation of certain futures and livelihood strategies. Specifically, the devaluation of rural futures in favor of urban ones is a

common feature of these imaginations. This devaluation is accomplished through what the economist described in a lecture he gave at this same conference as "framing," a critical priority on which he encouraged all gathered participants to focus more. He explained that a more positive framing of the decisions about what needs to happen in anticipation of climate change is important, with the caveat that "just this difference in framing doesn't change anything about the content," though it does facilitate cooperation. For example, while standing in front of a slide depicting an image of Mumbai's infamous Dharavi slum, he noted that "for a lot of people in rural areas, these places are opportunities for better jobs and higher salaries, better schools for their kids, access to health care." Framing a migration from a rural community to Dharavi, then, as an "opportunity" for a more robust livelihood is critical to this process of imagining and creating different futures. Thus, it is perhaps no surprise that reports on Robust Decision Making often cite out-migration from rural to urban areas as a key example of potential "robust options" (Hallegatte et al. 2012; Lempert et al. 2013). As the economist's comment about the rural migrants to Dharavi indicates, whether agrarian futures are "robust" or not, they are not understood to be normatively positive outcomes of development investment.

Therefore, decisions about what *should* be done as opposed to what *could* be done are quite different. The difference reflects the normative assessments and framings of what an ideal future might look like. In this way, Robust Decision Making, as a process of anticipatory ruination, creates opportunities for certain futures, while foreclosing others. In Bangladesh, the same logic can be observed in the planning discourses concerning the future of the coastal region. I turn now to an examination of these particular dynamics, and their impacts in Khulna.

Imagined Futures

Imagining the future of coastal Bangladesh is a critical moment in the process of anticipatory ruination, and one that development practitioners refer to often in discussions of how to plan development interventions in the coastal zone today. Through this work of imagining the future, notions of risk and uncertainty, along with normative evaluation of appropriate response, enter into the planning process. Framing the region's future crisis involves claims to the need for both 1) general acquiescence and 2) specific authority by development practitioners. Each claim is explored in turn below. The expansion of shrimp aquaculture in Khulna plays a pivotal role in the region's anticipatory ruination, shaping both its context and realization. The effects of climate change, shrimp production, and the complex histories of dispossession tied up in development since the colonial period, are all part of the same interconnected dynamics of the spatial governance of the region.

Calls for acquiescence to the changes climate change will require are the beginning of this process of anticipatory ruination. Experts explain that while the future is uncertain, they assert the need for candid discussions about the possibility that ruination is inevitable, as well as the need to proceed in the absence of clear scientific data assessing this inevitability. Finding solutions will be difficult, as one expert explained, because "all solutions are bad solutions for some people."[54] Thus, as another explained, echoing a common refrain among development practitioners working in this field, the adaptations that will be deemed necessary "will make us feel uncomfortable" but, she continued, "we need to move forward despite feeling uncomfortable."[55] The need to resign ourselves to the discomfort of the inevitable destruction is critical to this discourse. As one expert explained in a seminar at the Asian Development Bank office in Dhaka, "accepting failure" of adaptation, instead of denying it, is critical to forging strategies for what to do in response to

[54] Comments made by an adaptation practitioner at a public lecture in Dhaka, 23 December 2014.
[55] Comments made by foreign researcher and planning professional at a conference in Dhaka, 1 January 2015.

climate change.[56] Another expert, working on a climate change project for one UN agency, explained more specifically (referring to plans to support the growth of shrimp aquaculture instead of adaptation of water management to support rice farming systems), “we are not going to make things better with [river] dredging or water management, but there is definitely going to be shrimp farming.” In this way, the expert explains that shrimp farming can be the only alternative to the inevitable failure of other strategies for addressing environmental problems. By rejecting the possibility of strategies for effective mitigation of contemporary water management challenges, the practitioner effectively forecloses the possibility of an agricultural future for the region. These comments speak to an important paradox at the heart of anticipatory ruination - that is, despite our *lack* of knowledge about what will happen (explored further in chapter 4), there is a discursive construction of the inevitability of ruination; moreover, despite the tremendous energies being committed to devising solutions, it appears already known that the only possible solutions will not preempt inevitable ruination of landscapes and communities. Discussion of spaces and livelihoods that experts claim are "uninhabitable" and "unviable" bolster this language of inevitability, collectively naturalizing ruination.

Development planners and practitioners respond to this language of inevitable ruination with claims to the necessity of their own authority in devising responses. "We need to create a vision for the future," explained the expert concerned with discomfort cited above, precisely because of the need for uncomfortable solutions. Another adaptation expert explained to me that in this context, "no one can know what they'll be doing in three or ten years down the road, including us, so as researchers and professionals, it's our job to figure out what that future will look like and then to introduce people to it so they can begin to adapt."[57] This quotation speaks to

[56] Comments made at seminar at ADB office, 27 October 2014.
[57] Interview with the author, 30 April 2014.

a particular understanding of governance through knowledge production. Specifically, that the role of experts is first to imagine (in the absence of knowledge) what the future could or *should* look like, then to introduce it, and then to create it. The articulation highlights the normative and dialectical nature of anticipatory ruination, combining both epistemic and material dynamics.

The normative dimensions of this discourse are most commonly articulated as an afterthought, while the difference between what is *possible* and what has been deemed *preferable* remains ambiguous. A program manager at one UN agency explained to me his project's support of shrimp aquaculture programs (and thus inundation of agricultural lands with saline water): "in those areas, it's probably better to adapt to water. Water will come. It's probably much more beneficial than agriculture."[58] In this case, it remains murky whether the practitioner's assessment of the superiority of aquaculture to agriculture is due to its suitability to the ecological context, or some other normative claim about the relative economic benefits of shrimp vs. rice. What exactly is driving the change ("water will come") is also left unspecified. The active nature of the decision to bring water onto the land is obscured in such discourses. Similarly, a practitioner with one German-supported development agency objected when I asked him a question about why his program supported shrimp instead of rice production, by explaining "no, shrimp is the major export earner, so we must support it." But he then continued, "in 10 years, who knows what will happen? We have no idea."[59] In both cases, the practitioner's own assessment of the economic importance of shrimp nullifies the question of the kinds of production systems which are and will be possible in the region in place of normative assessments of the production system which is most desirable. Moreover, the role of programs like his in shaping the answer to this question of what will happen in 10 years, is also obscured. Yet, this developmentalist economic logic, which sits

[58] Interview with the author, 18 May 2014.
[59] Interview with the author, 12 November 2014.

outside of an assessment of climate impacts, is overlain on the evaluation of what "should" be done, to produce the logic of anticipatory ruination.

Thus, whether the inevitability of ruination is due to the imminence of climate change or, alternately, a particular analysis of economic imperatives, remains an unlikely and unnecessary question. The anticipated future of the region is the same in either case. Development practitioners regularly refer to Bangladesh as a "model," "leader," and "pioneer" in adaptation, in the sense that the very act of imagining the ruination of this region creates possibilities for its transformation and ruination as forms of adaptation in themselves.[60]

Depolderization

Finally, I turn to a nascent proposal for landscape engineering that suggests a potential logical extreme for the anticipatory ruination already being pursued in the region. This incipient imaginary is known loosely as "depolderization." Though no concrete designs for depolderization have yet been produced, early proposals describe the potential for addressing the threat of sea level rise throughout the coastal region by physically dismantling the large network of embankments that surround the islands throughout the coastal zone.[61] Removing the embankments would allow tidal waters to inundate the area within, either completely or partially for certain times of the year or an extended period of several years. At this point, the concept of depolderization exists more as an ideological project than a concrete paradigm for land and water management. However, its ideological power is significant. It not only shapes possibilities for the future, but it also holds sway in conversations about what is possible and desirable in the present

[60] On a longer history of the use of Bangladesh as a paradigmatic development "laboratory," see Hossain 2017.

[61] The islands surrounded by these embankments have come to be known as "polders," referring to the Dutch term for low-lying land surrounded by protective dykes, within which water levels can be controlled through a combination of inlet and outlet channels and pumping equipment.

and immediate future. In this sense, it plays a significant role in the future and present of adaptation in the region.

Depolderization has been embraced most earnestly in Bangladesh by the World Bank, and has received critical support on both sides of the border from the India bureau of the World Wide Fund for Nature (WWF).[62] The relevant programs of each agency encompass two concrete goals. The first involves mitigation of the geomorphological problems created by the embankments in the first place, including subsidence of land and sedimentation of rivers, both of which are exacerbated by the threat of sea level rise. The second goal of depolderization involves espousing a particular vision of development in the coastal region - in particular one that embraces the opportunities of a transformed economy. In Bangladesh specifically this means expansion of commercial shrimp aquaculture and the expansion of an urban-based, industrial economy.

The physical and social implications of depolderization are dramatic, entailing a complete landscape transformation. Before embankments were built, the natural tidal pattern involved the inundation of coastal lowlands twice per day during certain parts of the year. Human settlements were established on highlands, with homes often built on plinths, while low-lying wetlands were used either for fishing or cultivation of traditional rice varieties (which not only tolerate this periodic flooding, but were also fortified by mineral-rich tidal sediment deposits) (Datta 1998; Duyne 1998; International Bank for Reconstruction and Development 1972b; Westland 1874). Discourses proposing depolderization suggest a "return" to such a hydrological regime. However, the polders in Bangladesh have dramatically transformed the landscape such that by obstructing the tidal deposition of sediments onto the lowlands, combined with subsidence of the land and

[62] These plans are expounded in a WWF report (Danda et al. 2011) and World Bank proposal (The World Bank 2015) described in detail below. I expanded my understanding of the vision and implications of depolderization through several interviews with staff and consultants at The World Bank, WWF, and Bangladeshi state agencies concerned with water management.

relative rise of riverbeds surrounding them, in many cases the land within the polders has become lower than the low-tide level of the surrounding rivers. Thus, removing the embankments today would likely cause complete inundation of entire islands, and the necessary displacement of the communities that inhabit them. Depending on the scale of depolderization, the populations affected could be tremendous: one World Bank expert suggested "millions and millions" of coastal inhabitants.

The World Bank has long provided financial lending support for water infrastructure in Bangladesh, including for the construction and re-construction of the coastal polder system. Most recently, the Coastal Embankment Improvement Project (CEIP), which the World Bank cites among their chief climate change adaptation programs, is focused on improvement of a series of pilot polders across the coastal zone. While the goal of the CEIP is ostensibly to fortify the embankments, it has also provided the grounds for discussions about whether the polders should exist at all. One of the components of this project proposes? to engage an international consulting firm to devise a "sustainable polder concept" proposal for long-term engineering and management of the coastal landscape (World Bank 2015). World Bank employees and consultants whom I interviewed about this project referred to it as "Polders 2.0," a concept that they explained must involve the possibility of depolderization. Thus, even as the Bank invests millions in reconstruction of the polders, according to one Bank staff member in a presentation to a group of foreign donors, "much of the money" will go toward generating this new long-term vision for physical, social, and economic transformation.

Wherever depolderization is discussed (by consultants, donors, and practitioners), it is talked about as an integral component of a broader vision of development for the region. That is, the anticipation of climate crisis combines with and brings about a normative vision of developed futures. These imagined futures entail the end of rural livelihoods in the delta, replacing them with

a highly stylized (and age old) vision of development where the rural population transitions into an industrial labor force.

The normative dimensions of this vision are fleshed out in much greater detail in a report published by WWF in Kolkata in 2011 (Danda et al. 2011), funded by a World Bank project working to pioneer and integrate a new vision for managing and transforming this landscape on both sides of the border. The first four chapters of the report, entitled "Indian Sundarbans Delta: A Vision," detail the environmental hazards produced by a variety of different social and physical drivers, including sea level rise and other effects of climate change, overpopulation, and improper construction and maintenance of coastal embankments, dating to the colonial period. The fifth and final chapter details a phased strategy for depolderization and depopulation of an area encompassing over 200 villages. A World Bank Strategy Report entitled "Building Resilience for Sustainable Development of the Sundarbans" describes a similar vision, providing even greater detail about roll-out of particular interventions through which the vision will be accomplished over a period of 5-30 years. "Sustainable" economic development will be promoted in new peri-urban centers through vocational training for the future economy of the Sundarbans region, which involves tourism and "modernized aquaculture," and so that residents might "successfully integrate themselves into cities" (219). In the latter phases of the strategy, remaining residents will be induced to migrate through the elimination of support for basic services and infrastructure. Experts at one workshop in Kolkata focused on this strategy for Sundarbans development speculated that farmers, fishermen and their offspring currently living in the Sundarbans region would be much better off if they could be prepared for a transition into India's booming urban IT industry. "Give them proper skills," one World Bank expert implored, "they will run away!" In this development narrative, the IT industry represents the New India – the vision of an urban future for which the

World Bank and other development agencies are striving. Responding to climate change is just one plank in pursuing this vision of development.

A reproduction of a painting included in the final chapter of the WWF report illustrates this vision evocatively. The painting depicts a bird's eye view of the Indian Sundarban region, with the tall buildings of the Kolkata skyline at the far edge of the horizon. In the foreground, one can see the clear lines of the islands along the coast of the Bay of Bengal. A broad swath of these islands further inland, however, appear to be vanishing into the water. At the edge of the Sundarbans, three small cities have sprung up, depicted by a few skyscrapers highlighted within bright red circles. One of the report's authors described to me his conversation with the artist from whom he commissioned the painting for the report, proudly displaying the original full-size piece framed in his office. He gave the artist a current map of the Sundarbans, he explained to me, but specified "you have to make some of the islands disappear, and portray that nature is taking it back, and portray that we have made some arrangements for these people." Here, then, is the vision for the future of the Sundarbans: vast tracts of islands vacated of their agrarian populations, who have relocated to industrial centers where they have been trained for their new urban livelihoods.

The report's author described to me the enthusiasm with which this vision was received by the World Bank. A standing-room only crowd at the World Bank headquarters in DC was excited, he explained, about new opportunities for investments in the "new" Sundarbans, for example in Tata Housing,[63] which presumably was depicted by the tiny cities of the future in the report's painting. The vision is a powerful one. And while no concrete steps have yet been taken toward active resettlement, WWF has received financial support toward the dissemination of this vision

[63] Tata Housing Development Company is one of India's largest real estate development firms. It is a subsidiary of the Tata Group, a multinational conglomerate which claims annual revenues in excess of US $100 billion. They are known for their investments directed at India's growing urban middle class market; hence, Tata Housing would be an ideal developer for the imagined future cities on the periphery of the Sundarbans.

from GIZ and DFID, in addition to the World Bank. Dissemination takes place through conferences and workshops, gratis field visits to the region for journalists, donors, government and NGO officials, and public consultations with residents of the Sundarbans themselves. Clearly these diverse constituencies have responded to the vision quite differently. The report indicates that in preliminary consultations concerning the vision, only about 5 percent of current inhabitants expressed an interested in such migration entailed in the vision. The report speculates that this lack of interest may be due to reflection on "the experience of involuntary displaced people in other parts of the country" (40).

Experts who propose this displacement do not do so without awareness of the political implications of proposing resettlement at such a massive scale. At one workshop in Kolkata in January 2015 for development planners from both Bangladesh and India at which a number of reporters were in attendance, World Bank and WWF experts repeatedly corrected one another for using the words "migration" and "resettlement," which they acknowledged were "dirty words." One expert, responding to such a chastisement, noted "we don't need to call it migration, we can call it 'gaining a higher standard of living.'" The concern indicates an acute awareness of the profoundly contested history of displacement and forced migration for development projects in India. However, experts affirm, climate change offers an opportunity for changing this narrative about development's displacements. In the context of climate change, development-induced migration should be seen as a (now-necessary) opportunity, instead of a threat. One researcher expounding the economic potential of migration out of Bangladesh's coastal region to a workshop on climate change adaptation in Rotterdam entreated the audience, "don't think of resettlement... think of all kinds of connectivity!" The strength of the state and its capacity for carrying out such activities is also a factor inflecting the legitimacy of such visions. One World Bank planner in Bangladesh explained to me that the potential for depolderization currently seems much more feasible in

India, where the government has a "much greater capacity for these kinds of massive resettlement projects." Even as development practitioners on both sides of the border are clear that active resettlement will be the responsibility of the government (as opposed to non-state actors such as the World Bank), there is no question that it can be supported and pursued through the work of development and climate change adaptation carried out by NGOs.

Conclusion

The anticipatory ruination of Khulna through the expansion of shrimp aquaculture follows the same contours of epistemic intervention as those promoted globally through development planning in response to climate change, including through the Robust Decision Making model. In Khulna in particular, this logic operates as a progression, masking the histories of each of its elements: uncertain future ruination becomes an explanation for the inevitable unviability of agriculture, shrimp aquaculture is proposed as an alternative, experts conclude that it is preferable, anyway, and should be embraced immediately as an opportunity. This entails a clear vision of what an ideal future is for communities in Khulna, divorced from those communities' own visions of what is possible or desirable. Climate change becomes a post-facto justification for a process of ruination through the planning of particular development interventions both historically and into the future.

Examining the dynamics of anticipatory ruination in Khulna sheds lights on the stakes in succumbing to the teleologies of climate crisis in their material and epistemic dimensions. By understanding the production of anticipatory ruination, we are better able to understand not only the dynamics of dispossession, but also the alternative futures that are obscured in Khulna and elsewhere. The efforts of local communities and social movements (such as the one mentioned above composed of local farmers fighting against shrimp) to highlight these dynamics of ruination,

helps us to understand both their antecedents, as well as to suggest the possibilities of alternative futures.

CHAPTER 4

OPPORTUNITY/CRISIS: ON THE POLITICS OF UNCERTAINTY

"As we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – the ones we don't know we don't know." – Donald Rumsfeld[64]

In March 2014, The New York Times ran a cover story with the provocative title "As Seas Rise, Millions Cling to Borrowed Time and Dying Land" (Harris 2014). The article examines what it calls the "uncertain future" of coastal communities in Bangladesh's southwestern delta region. It weaves together scientific projections of sea level rise and climate change impacts in the region with intimate stories and photographs of villagers grappling with an increasingly volatile landscape. The author laments the "millions living on borrowed time in this vast landscape of river islands, bamboo huts, heartbreaking choices and impossible hopes." These "hopes," the author explains, are primarily pinned on the possibilities of staying in (or returning to) villages in the coastal belt that the author describes as "doomed." The article thus demonstrates a common refrain about this region and its inhabitants that circulates in popular media, academic, and development policy discourses. The uncertainty of environmental change evinces the impossibility of a future of this landscape and the communities that now call it home.

The images in the article, taken in Bangladesh's Dacope sub-district, on an island nestled alongside those where my own field sites are located, and that I have visited several times, were familiar to me, but the narrative (though not surprising) was incongruous with those I myself have heard there.[65] The photographs depicted vast grey landscapes degraded through salination by commercial shrimp aquaculture, which over the past three decades has taken over this and

[64] Cited in Morris (2014).
[65] For a more extended discussion of the particular agrarian political economy in Dacope and and mobilization against shrimp there, see Afroz et al. (2017).

surrounding islands through rampant, unchecked land grabbing. However, though these vast tracts of shrimp ponds were depicted prominently in the article's photographs, and the effects of their cultivation were evident in the lack of vegetation and visible salt deposits, the article failed to even mention the presence of aquaculture in the area, its grave impacts on the ecology, or the deep imbrication of these concerns with those related to climate change. It is clearly far more compelling to think of Bangladesh's coastal region as a space that is "disappearing" than a space in which the social dynamics of production have been transformed through global export markets, thus causing social and ecological devastation.

While these apparent omissions in this piece appear stark, they are not anomalies. Indeed, the piece both contributes to and draws on a narrative about this region, the southwest of Bangladesh, that frames a particular understanding of its ecological past, present, and future. The article is representative of the ways in which what is known, thought to be known, or currently being investigated about the ongoing ecological changes taking place in the southwest are taken as scientific facts, and specifically that these "facts" suggest that the region is, in the author's own words, "doomed." The article also represents the limited frame within which these ongoing ecological changes are understood, the kind of narratives that are mobilized, as well as those that are elided.

In what follows, I explore the politics of knowledge that shape scientific and popular narratives about this region, along with the normative assumptions that inform them. I examine how uncertainty is *practiced* to shape landscapes and communities. Uncertainty is not a static condition. It is mutable and negotiable. It changes as it traverses different research programs and policy dialogues. It is often both cause and result of contestation. Confronted with the existential threat of ecological collapse, how do the politics of uncertainty shape decisions over where and when there is no hope and no possibility of return? I suggest that uncertainty can be practiced in

both the presence and absence of information. Between different processes of producing and acting on knowledge, uncertainty emerges often as the result of deliberate choices. In what follows, I explore how these politics and practices of uncertainty are manifested in a series of programs at the interface of research and intervention.

This work builds on a robust literature in Political Ecology and Science and Technology Studies investigating the social context and epistemological politics of climate science (Jasanoff 2010; Demeritt 2001; Günel 2016; Barnes and Dove 2015; Miller 2004). Beyond this focus on the social relations that govern the production of knowledge, I am concerned primarily with the circulation of knowledge about environmental change, its drivers, and possible responses. This latter focus highlights the ways in which the production and circulation of knowledge are intertwined with one another. The politics of uncertainty emerge through this relationship between the two.

Understanding the Ecological Crisis in Southwestern Bangladesh

Among the broad reflections of scientists studying the drivers of change in the southwest, two clear analytical themes emerge. The first is that at the local level, it is not possible to analytically separate the effects of climate change and sea level rise from other drivers of change, such as shrimp farming, large-scale engineering projects, and cross-boundary water-sharing issues - there is no way of knowing, these scientists explained to me, the relative importance of any of these dynamics in driving the ecological changes most often attributed to climate change.[66] The second, relatedly, is that while it is difficult to parse these various drivers, it is clear that climate

[66] What is known, however, is that these dynamics are embedded in broader secular dynamics of social and biophysical change in the delta, which is in an active state of dynamic transformation.

change is not the only driver of these transformations, and, most insisted, it is probably not the primary driver of change.

A third related concern that many stressed in both public and private conversations, was that the scientific data about ecological change in the delta is often misunderstood. Many cited concerns about their own data or that of their colleagues being mis-quoted, mis-interpreted, or oversimplified, leading to flawed narratives about the scientific evidence of present or future change. One prominent social scientist whose work has drawn considerable attention to the challenges posed by climate change to communities in the coastal region, expressed dismay about the "stylized" way in which these impacts are discussed, particularly in popular media portrayals of climate science. He explained that this "stylized" narrative about the threats of climate change to Bangladesh reflected basic misinterpretations of the geomorphology of the region.

A combination of interconnected ecological problems poses threats to production and habitation of rural areas throughout the southwestern coastal zone (Nicholls et al. 2015). For the reasons described above, it is not my intention to mediate between narratives highlighting these various drivers of ecological change and strands of reasoning that exclude any of them in understanding the transformations currently taking place in the southwest. Rather, I emphasize that each has played an important role, and examine the dynamics through which knowledge about various drivers of change are elided.

Some aspects of the region's environmental characteristics and challenges faced in water and landscape management were examined in Chapter 1. These historic patterns continue to be manifested in the coastal region today, but have taken on new significance in relation to climate change. The predominant environmental concerns in the coastal region are related to patterns of tidal activity at the shifting interface of land and water. Because of the proximity of these dynamics of tidal activity to concerns related to sea level rise, there is often ambiguity or uncertainty about

the precise causes of change, and about the boundaries between them. This also generates spaces of uncertainty about the role of human intervention at this interface of different drivers of change.

Soil salinity is an important example, as it is a constant subject of debate among researchers and development practitioners. During the wet season from June to October, the monsoon rains gather along the rivers from upstream; as they flow into the estuary, they push the brackish tidal waters back down toward the saline Bay of Bengal. During the dry season from November to May, with less water flowing down through the rivers, the tidal waters push back up the rivers and creeks, bringing salinity with them. The result is a salinity frontier that moves up and down throughout the year in the coastal region (Lázár et al. 2015; Clarke et al. 2015). Crops are selected for cultivation in large part based on their tolerance to the level of salinity at a given location. Sea level rise is likely to impact this frontier by causing the tides to move further inland, thus linking soil salinity to climate change (Dasgupta, Kamal, et al. 2014). However, sea level rise is not the only factor driving this shifting salinity frontier. When India built the Farakka Barrage, much of the water from the Ganges was diverted away from Bangladesh.[67] While these numbers of disputed, the Bangladeshi government claims that the barrage reduced the Ganges water flow by 70% (Hossen and Wagner 2015). The withdrawal of upstream water flow resulted in increased salinity in the coastal region, as tidal waters moved inland (Ito 2002; Chapman 2007; Bradnock and Saunders 2000). Finally, as explored in Chapter 2, shrimp aquaculture has been perhaps the clearest human-induced driver of increased soil salinity, as land is intentionally inundated with saline water in the dry season to flood *ghers* for shrimp cultivation (Clarke et al. 2015; Afroz and Alam 2013; Haque 2006). Salinity from the rivers affects crop production when it gets into the soil

[67] There is a great deal of uncertainty and contestation about the effects of the Farakka Barrage, with analyses of its physical impacts being fairly firmly divided between India and Bangladesh. The Indian government, public, and scientific community largely dispute the impacts claimed by their corresponding communities in Bangladesh. India built the Barrage initially in order to bring more water to the Port of Calcutta, which was experiencing excessive siltation due to decreased flows, obstructing the traffic of ships to the port.

– this can happen through accidental inundation (when the embankments are breached), intentional inundation (for shrimp aquaculture), or through excessive use of saline water for irrigation. Salinity is leached out of the soil annually when the land is flushed with monsoon rain (Clarke et al. 2015). However, if salinity seeps into the underground aquifer, which can happen either through the the continual inundation for aquaculture (Barraclough and Finger-Stich 1996), or through groundwater depletion (through excessive withdrawal by deep tube wells for irrigation) (Davis and Ali 2014), then it is a much more serious concern. Though this salinization of aquifers is already happening, it is believed that sea level rise could also contribute to saltwater intrusion into the aquifers (Clarke et al. 2015; World Bank 2010; Huq, Ali, and Rahman 1995).

These drivers of salinity are also closely linked to other environmental changes in the delta. Water logging, discussed in more detail below, is closely related in the sense that persistent inundation with saline water drives salinization of soil and groundwater. Sporadic and chronic water logging has several different causes and drivers, all of which are a source of ongoing debate. In discussions about climate change, the most important of these is sea level rise, which is consistently invoked as the greatest threat of climate change to Bangladesh's low-lying delta. The rise of the river levels relative to land levels is a topic of considerable attention by the community of scientists working in this region (Nicholls et al. 2013; Kay et al. 2015; Brown and Nicholls 2015; Pethick and Orford 2013). Yet, the term "sea level rise" is often used as shorthand to refer to to *absolute* sea level rise, the increase in the absolute volume of the oceans as a result of climate change-induced factors such as the melting of polar ice caps. Absolute sea level rise is thus tied to global patterns of environmental change (Ballu et al. 2011). Relative sea level rise, however, referring to the observed difference in sea and water levels in a particular coastal landscape, is a dynamic that can only be observed locally, as it interacts with the vertical movement of coastland and a variety of local drivers of change. Nicholls and Goodbred argue that there has been an

"over-emphasis on the issue of global-mean sea-level rise, versus other possible changes," highlighting a variety of human-induced drivers of relative sea level rise in the GBM delta (Nicholls and Goodbred 2004, 11). In Bangladesh, land subsidence (related largely to the polder system, as explored in Chapter 1) is a major contributor to this relative sea level rise (Darby et al. 2015; Auerbach et al. 2015a; Brammer 2012; Brown and Nicholls 2015).

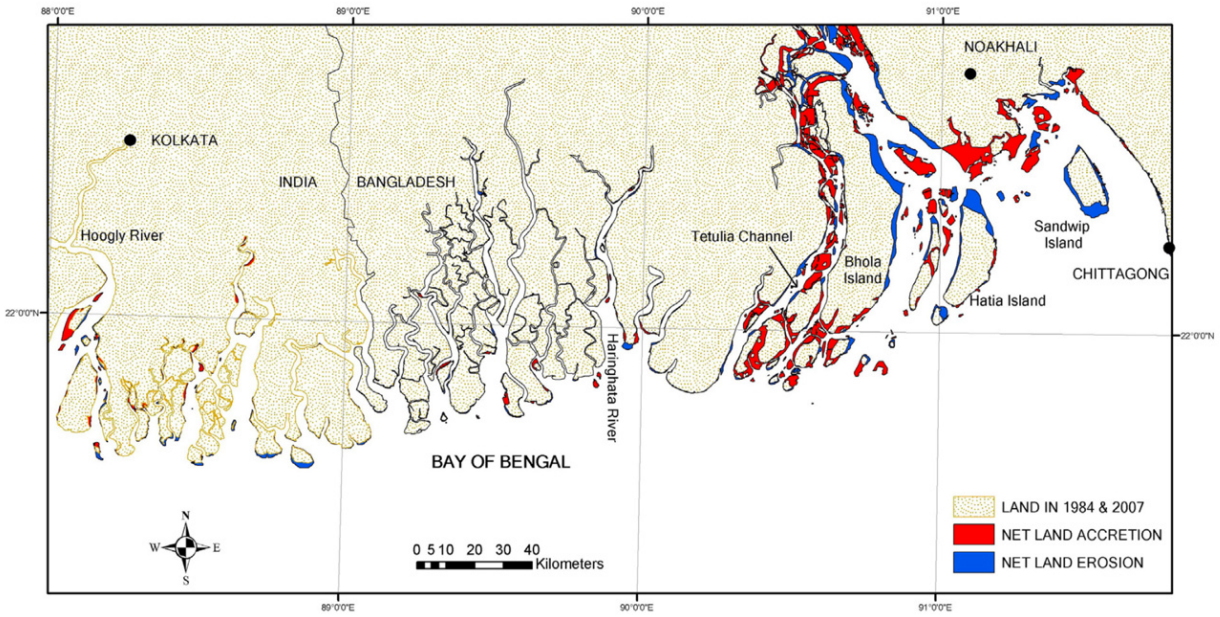

Figure 26. Land erosion and accretion between 1984 and 2007 across the southern coast of Bangladesh. Source: (Brammer 2014a)

Land erosion is another dynamic of physical transformation that is often conflated with absolute sea level rise (Ahmed 2011; Brammer 2014a). As discussed in Chapter 1, the GBM delta, being exceptionally active in its ongoing formation, is in a constant state of erosion and accretion. As observed in the New York Times article discussed at the beginning of the chapter, this land loss related to erosion is often attributed to climate change-induced sea level rise. Hugh Brammer, a physical geographer with over 50 years of experience working in Bangladesh, refers to these as "wildly mistaken assertions" (Brammer 2014b, xvi), highlighting the historic nature of the process of constant erosion in the GBM delta. There is also scientific consensus, however, that relative sea level rise will exacerbate existing patterns of coastal erosion (Wong et al. 2014). Despite land loss

in many parts of the delta, Brammer's analysis suggests that between 1984 and 2007, the Meghna estuary alone experienced an annual net land gain of 19.6 km^2 (see Figure 26). This augments Allison's findings that between 1792 and 1998, the Ganges-Brahmaputra delta saw an average annual net land gain of 7.0 km^2. Building on an analysis of similar trends, Darby and colleagues project that climate change could result in a net increase in these rates of land accretion, as the rivers may carry an increased sediment load to the delta form the melting Himalayan glaciers (Darby et al. 2015). This would suggest that, contrary to ominous predictions of Bangladesh disappearing, climate change could in fact cause the country's land mass to grow larger.

Finally, increasing vulnerability to cyclonic flooding and storm surges is also considered a significant consequence of climate change in Bangladesh (Dasgupta, Huq, et al. 2014; Akter and Mallick 96), with a wide variety of drivers. The notion of "vulnerability" itself reflects a range of social, political, economic, and historical dynamics (Watts and Bohle 1993), and thus vulnerability to cyclonic activity in Bangladesh must be understood as a complex relationship between a variety of transformations. In the physical sense, however, this increased vulnerability in Bangladesh is also the result of transformations in the landscape. Specifically, the deforestation of the Sundarbans, both related to recent shrimp farming and other historic patterns explored in Chapter 1, has diminished the critical buffer against storm surges that the mangroves provide (Rahman and Rahman 2015; Barua, Chowdhury, and Sarkar 2010; Islam and Haque 2004).

In recent years, all of these dynamics have been attributed primarily to climate change, and, indeed, their intensity and amalgamation have amplified the sense of climate crisis. Yet, they are each embedded in complex histories and political economies of the region (Brown et al. 2014), histories that are masked by narratives of ethical neutrality and scientific credibility of this new climate science consensus. Recognizing or assigning relative weight to these various drivers of change is a significant source of uncertainty among scientists and development agencies alike.

While most scientists recognize that each of these drivers play a role, not all development practitioners do. For example, many practitioners involved in shrimp aquaculture programs suggest that shrimp farming is a response to, rather than a cause of, salinity; the implications of this disagreement are examined further in Chapter 3.

Reflecting on this broad spectrum of drivers of coastal environmental change, a group of leading natural scientists wrote in a Commentary in Nature Climate Change in 2014, "Herein lies a paradox: economic and population growth can increase risk, but economic growth and prosperity promotes adaptive capacity" (Brown et al. 2014). The paradox outlined by these scientists is at the heart of contestations over understandings of vulnerability to climate change in Bangladesh and potential adaptation responses. Even as they recognize that certain human interventions might transform landscapes in ways that increase vulnerability to climate change, they also suggest that those same human interventions might increase the ability of communities to respond to those transformations. Decisions about how to navigate this paradox are thus political decisions based on normative visions of the future under climate change. Uncertainty both emerges from and becomes a key instrument in navigating these contentious politics.

Who are the Climate Scientists in Bangladesh?

My approach to this interpretation of ecological change is motivated by interviews and participant observation with researchers studying the ecological and geomorphological impacts of climate change in the southwest. This work is carried out by a wide variety of researchers of different nationalities, institutional positions, and areas of disciplinary expertise. My intention was to understand who these people were, how they did their research, what it showed, and how it engaged with and impacted development policy. The diversity among and collaboration between researchers working in this field makes it difficult to neatly categorize them. I spent time with

Bangladeshi and foreign researchers, university faculty, staff of NGO research centers, and consultants hired by donors and NGOs for specific projects. These people frequently occupied several of these categories simultaneously or at different points in time. In particular, the boundaries between foreign and local knowledge and expertise are not clear, as many scientists have worked and been trained both in Bangladesh and abroad. Moreover, foreign researchers with little experience in Bangladesh often rely heavily on their Bangladeshi counterparts for fundamental information about the country both within and beyond their own areas of expertise.

One instructive example of the range of different kinds of disciplinary expertise being applied to these questions in Bangladesh is a major collaborative research project called ESPA Deltas (ESPA stands for Ecosystem Services for Poverty Alleviation). I had heard about this project repeatedly in Dhaka from several development agencies that intended to put its findings to use in the design of their adaptation programs, and I came to know it better when I met affiliated British researchers at a climate change adaptation conference in the Netherlands. ESPA Deltas was composed of a multi-disciplinary and multi-national team of researchers studying ecosystem services and poverty alleviation in the GBM delta. Supported by a group of British research and development agencies including DFID and ESRC, the goal of the program was to support policy makers in understanding ongoing environmental change in the delta and the role of policy in shaping it. Like much of the scientific research being carried out in this area, the program did not exclusively address itself to climate change, but instead took climate change as one of many drivers of change affecting the region that it intended to understand collectively.

The consortium of which ESPA Deltas was composed included faculty from major British research universities with expertise in coastal and environmental engineering, ecological economics, hydrology, water policy, and geology, among many other disciplines. Several of them have been lead or contributing authors to the reports of the Intergovernmental Panel on Climate

Change (IPCC).[68] These researchers partnered with a broad spectrum of Indian and Bangladeshi researchers, including several faculty from the Institute of Water and Flood Management (IWFM) at the Bangladesh University of Engineering and Technology (BUET). IWFM is Bangladesh's premier institution for expertise in water engineering, and its faculty are almost universally enlisted in studies or program design concerned with hydrology or water engineering in the country by the Bangladeshi government, foreign aid agencies, and donors and development practitioners alike. While its faculty have exceptional expertise and experience with hydrology and water engineering in Bangladesh, they rarely if ever have funding for implementing independent research of their own design and conception. Although one IWFM Professor was a Co-PI on the ESPA Deltas project (no doubt contributing immensely to research design and execution), the funding and conception of the study in the UK certainly shaped the research, the makeup of the consortium, and the products of the collaboration.

When I interviewed one Bangladeshi government water planning official about the World Bank Polders 2.0 program (discussed in Chapter 3), he brought up IWFM in the course of talking about the kinds of expertise that could be employed in conceiving of a strategy to address the technical problems with the design of the polder system. The World Bank's Terms of Reference for Polders 2.0 stated explicitly that only an international consulting firm could be hired to carry out this work (one World Bank administrator explained to me later that this was the result of a legal technicality in the World Bank's procurement policies). The government official lamented to me that IWFM faculty had the knowledge and expertise to do this kind of work, but they were never given the chance, always included as the subsidiary consultants to teams of researchers from outside Bangladesh. If they were given the funding and opportunity to think creatively about what

[68] The IPCC produces reports reflecting the international consensus of leading climate scientists and participating governments about the cause and impacts of human-induced climate change, as well as options for adaptation and mitigation.

a new "sustainable polder concept" could look like (the stated goal of Polders 2.0), would they come up with something entirely different from a foreign firm?[69] In speculating broadly on his own question, the official supposed to me that if there could be a water engineering strategy inspired by indigenous water management systems and the GBM delta's unique tidal landscape, the scientists at IWFM would be the best people to devise it. Nevertheless, he speculated, the politics of research funding in Bangladesh are such that they would not be given this opportunity.[70]

In addition to these faculty, staff from other government and NGO research institutes were also included in the consortium, such as the Bangladesh Institute of Development Studies, the Center for Population, Urbanization and Climate Change at the International Centre for Diarrhoeal Disease Research of Bangladesh, and the government's Water Resources Planning Organization (WARPO). Finally, these agencies also develop partnerships in Khulna with local NGOs whose primary work involves connecting non-local researchers and development agencies with local communities through the identification of research field sites, organizing brief visits to the region, coordinating logistical details, and even giving presentations on the social and cultural contest of the area under study. While this last category of program partner would not be classified by the rest of the project team as scientific researchers, they play an important role in shaping the researchers' understanding of the region – who they talk to, what they see, how they see it, and the contextual information that informs their experiences.

[69] Given the ambiguity discussed elsewhere between "foreign" and "local" forms of expertise, this seems to me to be an open (nevertheless critical) question. All of the faculty at IWFM are of Bangladeshi origin, yet most of them earned their degrees abroad, primarily in the Netherlands, so their own knowledge and expertise is fundamentally transnational.

[70] These unbalanced relations of collaboration reflect a broader pattern in the production of climate knowledge observed by Corbera et al. (2015). The authors find that the collaborative relations in the IPCC Working Group III report on mitigation reveal persistent, unequal collaborative relationships between researchers in the Global North and Global South, with authorship dominated primarily by institutions and scientists in the Global North.

For example, I joined the ESPA Deltas project team on a field visit arranged by one such local partner that involved a tour by boat into the Sundarbans. On the way, we stopped at a massive shrimp farming operation, unlike any other I had seen in Khulna. Owned by a businessman in Khulna, the Sundarban Shrimp Private Limited enterprise spread out over 25 hectares, surrounding by high fences and lamp posts (see Figure 27). We were introduced to the manager of the operation, the only worker in slight, who told us about the operation's impressive productivity and economic returns. When we re-boarded the boat and were served giant Khulna tiger shrimp for lunch, I wondered aloud to some of my companions who had lived in that village before Sundarban Shrimp Private Limited had arrived. I wondered this again after lunch when the boat made a stop at a small settlement of landless people living on an embankment, who had apparently been displaced from their homes following a recent cyclone. They now worked collecting shrimp larvae with nets in the river.

The decision not to introduce these researchers to communities where agriculture has persisted (or been reintroduced), or to communities where residents remained to share different perspectives on shrimp aquaculture, certainly shaped the way they understood Khulna and the livelihoods of its inhabitants. The implications of this were demonstrated to me later in the day when one ESPA researcher studying out-migration from Khulna explained their research question to me as "what makes people stay in a shitty place?"[71] This researchers' identification of Khulna as "shitty" was evidently shaped by these relationships between research partners and interlocutors. Examining this broad spectrum of actors involved in the production and dissemination of knowledge thus facilitates an understanding of what is known, thought to be known, and uncertain about environmental change and life in Khulna today.

[71] I expand on this discourse of "shitty" lives in Khulna in Chapter 2.

Figure 27. Sundarban Shrimp Private Limited

The most important thing I learned from the ESPA Deltas researches was about the interactions between climate change and other drivers of environmental change, and how they are being actively shaped in the present. As one of the scientists involved in the project explained to me, even as people who have "built careers on" the study and dissemination of knowledge about climate change ("we're no climate change deniers!" one of them remarked to me), they also see it as critical to recognize that there are a lot of other social and environmental processes taking place, all of which are important to recognized collectively. Most importantly, they explained to me, there are things that can be done to mitigate the impacts of climate change (and, indeed, other environmental transformations) and that decisions are being actively made right now that shape the landscape now and in the future under climate change.

In addition to this work being done inside Bangladesh, there is also a great deal of research being done about Bangladesh by researchers outside the country, using computer modeling methods and remote sensing data. One leading environmental scientist at Columbia University who has worked in Bangladesh for several years recounted to me a story in which he presented a paper at an academic conference based on satellite data of Khulna combined with repeat visits to the region to verify the analysis and understand it better. Environmental scientists call this kind of work "ground truthing," and I found among those I interviewed in Bangladesh that they regarded this component of their research methodology with varying degrees of seriousness, ranging from casual sightseeing visits to sincere and insightful ethnographic interest, as I found to be the case of this scholar at Columbia. The paper he was presenting concerned dynamics of environmental change in the Sundarbans, and revealed that he and his colleagues had found no evidence of recent forest degradation there. After his presentation, two other scientists who had separately conducted studies of the region, but never visited Bangladesh, using different methods from the Columbia team to analyze remote sensing data, stood up to challenge his findings, arguing that they had each found that there was extensive degradation in the Sundarbans. He responded that they had seen no evidence of this degradation either in their satellite data or in their field visits; the dissenting scientists, who he described as "very emotional," were incredulous with disbelief, certain that this region must be experiencing degradation. His impression was that they had already formed assumptions about the certainty of degradation in Bangladesh, and that because of these assumptions, they were unable to consider the possibility of alternative data or analysis. "How could you be so confident when you had never even been there?" the Columbia scientist said to me. I asked him if he had observed this kind of dissent, involving certainty of degradation, relating to other regions or any of the other field sites where he works. He responded that "it is definitely the worst in Bangladesh – and you know why, right? Because Bangladesh is *the poster*

child." While contestations over scientific analysis are certainly nothing new, his experience and reflections reveal the role that anticipation of climate crisis in Bangladesh can play in shaping scientific data about the region, and how those assumptions are circulated and reproduced within and between scientific and popular discourses about environmental change in Bangladesh.

Circulations of Climate Science in Bangladesh

In Bangladesh, as elsewhere, conversations about climate change perpetually invoke climate science, and are eager to discredit denialists. Yet, my research on policy making surrounding how to address climate change in southwestern Bangladesh revealed extensive questions about what claims are supported by this "science," and, indeed, strong (though usually discreetly articulated) concerns about the need for better or "real science" in policy making. As one donor working on climate change issues in Bangladesh explained to me:

> "Of course there's an interest in calling everything 'climate change' right now, because that kind of puts you into this category of being 'the most vulnerable country to climate change…' But I think we're very, very weak on the science. We have a lot to do. One of the things we often say to the government is that we actually have to become better in that, because just saying that you are the most vulnerable country to climate change and that there will be 30 million climate refugees in the future and that, you know, most of the country will be gone, is probably not enough to keep the pity going for a very long time. If there are questions about what has really caused it, and where is the money going, the money can dry up very very quickly. Which is also sad, because, you know, I think climate change *is* happening."

As this donor's apparent unease suggests, there is a gap between what is said and what is known about climate change in Bangladesh, and this gap has potentially significant implications for how climate change is addressed.

The comments of the donor examined above are are not exceptional. Throughout my research, I frequently encountered questions among donors and policy makers about what claims are supported by "science" and the need for better or "real science" in policy making. There is also concern among some scientists about the invocation about scientific expertise where evidence is

deemed to be insufficient or excessively politicized; as one environmental scientist explained to me, “there’s been a proliferation of scientists – or people who call themselves scientists. Climate change is hardly even a scientific question anymore.” While this scholar would certainly not dispute that there is a great deal of critical and rigorous scientific research ongoing about the causes and impacts of climate change, his comments reflect frustration with the ways in which discourses about scientific evidence are deployed in ways that distort its findings to bestow credibility for political purposes. Instead of arbitrating what science is "real" or what claims are most accurate, relevant, or valuable, in this chapter I examine what is broadly understood about the science of ecological change in the southwest, in order to demonstrate how that knowledge is circulated to make particular claims about possible or desirable futures (and to diminish others). I examine not only what scientists, policy makers, and development practitioners respectively believe is "known" about ecological change and the future, but also their own perceptions of the utility and circulation of this knowledge within regimes of adaptation and development.

One staff member working on climate change adaptation projects at USAID in Dhaka estimated that approximately 50% of the funds they spend are related to knowledge production, knowledge management, or knowledge training, and told me that among his colleagues at USAID and other donor and development agencies, this production, management, and dissemination of adaptation knowledge is their primary interest in relation to climate change. The result is the amassing of a great body of data that frames the challenges and possible interventions in the southwest in relation to climate change. Yet, as the actors and relationships within ESPA Deltas demonstrate, knowledge about ecological change in the region and knowledge about appropriate interventions to address it are at once distinct and also mutually constituting. The imbrication of the two through the production of environmental knowledge alongside development interventions thus shapes how the changes are understood as well as how they are addressed. Stott and Huq

confirm this in their study of Community-Based Adaptation[72] practitioners in Bangladesh, finding that the circulation of knowledge about climate change and adaptation is both limited and textured by existing power relations within and between global, national, and local scales (Stott and Huq 2014).

A paper published in 2016 by two researchers at the Lamont-Doherty Earth Observatory at Columbia University highlights important ways in which these circulations of dystopic imaginaries about Bangladesh might intersect with the production of scientific knowledge about climate change in the country (Chiu and Small 2016). The paper uses data collected from tide gauges managed by the Bangladesh Inland Water Transportation Authority (BIWTA) to measure the actual tidal activity at 15 different locations throughout the coastal zone during cyclones occurring across the past four decades. It compares the observed data of storm surges (meaning the amount of sea level rise at a particular moment in time associated with atmospheric storm activity) with a series of studies that have examined these storm surges using computer modeling methods. The paper responds to widespread reports of up to 7 meters of storm surge heights in "a considerable body of literature" on the region, which the authors note has attracted considerable interest in the field due to the vulnerable nature of the delta. These reports of dramatic storm surge heights have garnered particular attention in the aftermath of Cyclones Sider and Aila (in 2007 and 2009, respectively), and have been linked with increased frequency and severity of cyclonic activity related to climate change. The authors note that "the focus of these studies is often to provide recommendations for decision makers rather than present new data on storm surge associated with cyclones" (Chiu and Small 2016, 1150), reflecting the fundamentally policy-oriented and political orientations of many

[72] Community-Based Adaptation (CBA) refers to a particular field of practice involving its own series of publications, transnational networks of practitioners and researchers, and conferences (the first of which was held in Bangladesh in 2005). Forsyth sees CBA as part of a broader trend to link climate policy with international development practice (Forsyth, 2013). In this sense, CBA plays an important role in the adaptation regime.

studies of cyclones in Bangladesh. However, contrary to popular reports and these modeled results, the authors find that maximum storm surge heights of Sidr and Aila were approximately 2.6 meters, and that in many locations during cyclone Sidr, the storm height actually decreased. These data can be observed in Figure 28, which indicates evidence of considerable increases in wind speeds at the point of each storm, but significantly lower storm surge data than reported, and in the case of Sidr, even some cases where the tidal gauges recorded a decrease in tidal levels.

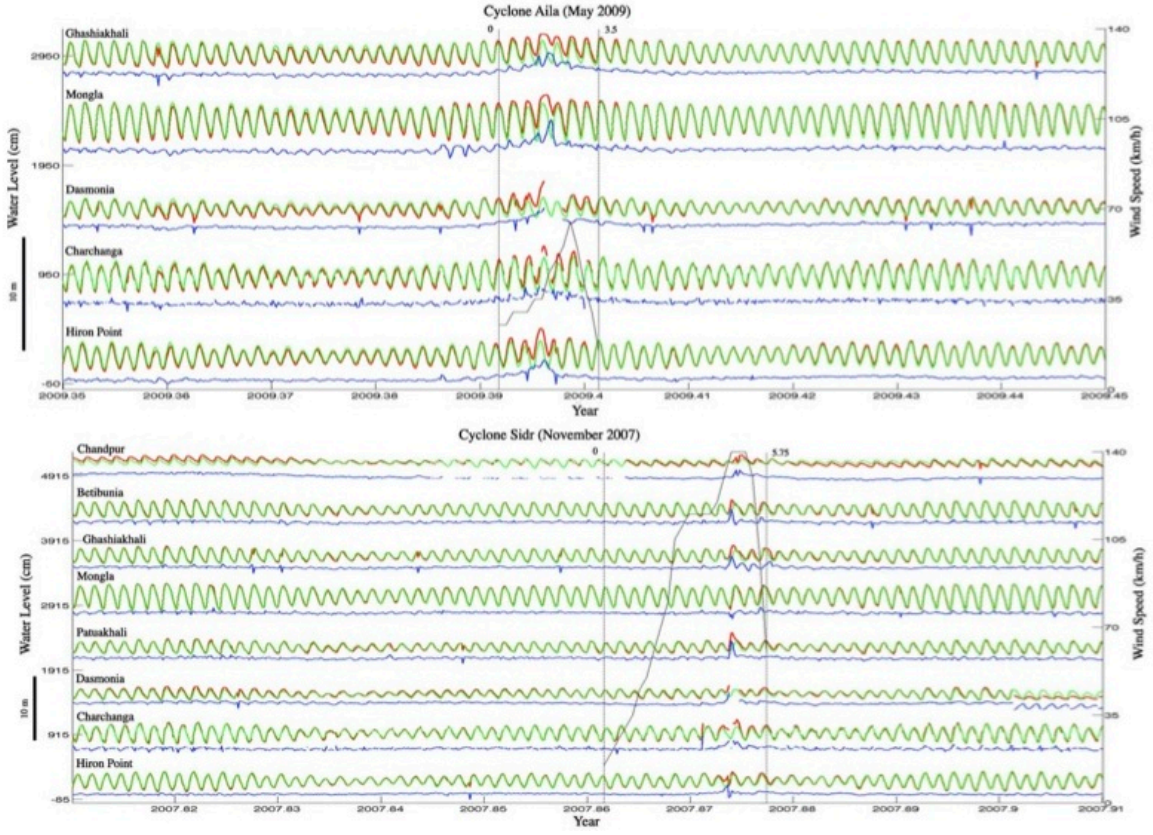

Figure 28. Water level records (red), modeled astronomical tides (green), water-level residuals (blue), and wind speeds (black) for cyclones Aila and Sidr. Source: (Chiu and Small 2016).

In the Discussion section of the paper, the authors take up the question of why their analysis of storm surges based on observed data could depart so conspicuously from previous studies based on modeled data. They propose that these analyses of higher surge heights of 2 to 7 meters could be based on models derived from reports of storm surges after the cyclones, rather than observed data based on *in situ* measurements. If Chiu and Small are correct in their analysis

of their own data, and its discrepancy with the findings of others', what we see here is the existence of (and a latter challenge to) a scientific consensus based on computer models derived from reports of a particular driver of catastrophic event which may have hardly existed, resulting from researchers creating models to fit catastrophic popular reports instead of observed changes. This is not to deny the very serious impacts of each of these storms; indeed, together they were responsible for thousands of deaths, and the damage they inflicted on the embankments and other coastal infrastructure caused incalculable harm. The Daily Star newspaper reported that Sidr killed around 4,000 people and affected around 1.2 million, while Aila killed 190 and affected around 3.7 million (Ahmed 2017). Yet, if these impacts were the result of wind speeds as opposed to storm surges, the discrepancy between these studies is significant. It indicates how a scientific consensus can emerge around the circulation of a particular imagination of a dystopic environment, whether or not that imagination is born out in reality.

Politics of Uncertainty

The diverse, intertwined drivers and dynamics of change, are defined by a sense and discourse of *uncertainty* over their relative importance in relation to one another - what changes they will cause, how they will do so, under what timeframes, and how they are interrelated with one another. This uncertainty is so central to the discussion of this region that it has itself become an important driver of change. While the specter of climate change and the uncertainty over its impacts on the future draws greater and greater attention to the region, it also draws attention away from the region's history and political economy, and their ongoing relationships with ecological transformations. To be clear, the uncertainty that marks the decisions about how to manage this space is real. But the way in which it is claimed, generated, and mobilized toward particular futures is marked by inequitable power relations. These unequal relations of power give

shape to the politics of uncertainty examined below.

Discourses and practices of uncertainty in relation to climate change are often associated with inevitability, though they are distinct from one another. However, these practices of uncertainty highlight how the sense of inevitability emerges out of discourses of uncertainty, and the modes of governing that result. Indeed, as Ann Stoler and contributors to her volume, *Imperial Debris* examine, degradation thrives on "the opacities which imperial formations produce" (Stoler 2013, 9). I examine below uncertainty as a politics and a set of practices, in both discursive and material formations. I focus on these practices to draw attention to the ways in which uncertainty is an active, rather than passive or incidental relationship to knowledge. Modes of governing emerge out of interactions with uncertainty by particular actors and through particular epistemes.[73]

This politics and practice of uncertainty takes many forms, of which I am concerned particularly with the following: 1) How uncertainty is *claimed*. By this I refer to the interface of science and politics: why and how particular uncertainties are identified. 2) How uncertainty is *generated*. Here I refer to the active production of a sense of uncertainty through ignoring and/or undermining that which is already known but that is seen as politically inconvenient. 3) How uncertainty is *mobilized*. This concerns the politics of what is done in the name of uncertainty, and how it is used to pursue particular ends in policy and development. In what follows, I explore each of these interconnected practices of uncertainty, and the ways in which they shape the dynamics of production and social reproduction throughout southwestern Bangladesh.

Understanding and Addressing Water Logging

Though recent years have seen a significant increase in attention to the southwest and the

[73] I refer here to Foucault's usage of episteme as "the 'apparatus' which makes possible the separation, not of the true from the false, but of what may from what may not be characterized as scientific" (Foucault 1980, 197).

particular ecological challenges it faces today, these concerns are not new, and neither are interventions seeking to address them. For the past 20-30 years, donors in Bangladesh have provided significant humanitarian relief funds for communities in the southwest affected by seasonal and persistent water logging, assistance that has grown steadily in its scope and magnitude. One European donor estimated that in the previous few years (prior to 2015), approximately 30 million euros had been spent on humanitarian aid related to water logging, remarking "what do you get for that? Well, you get a few people who have been kept alive, they might have a few more tarpaulins." In 2012, a group of these donors, motivated by a growing demand for funds to address this chronic crisis, and emboldened by "resilience" frameworks, which they said helped them to examine overlapping development challenges and objectives, joined together to investigate the "root problems" of water logging in the southwest. This investigation, managed by the FAO Bangladesh office on behalf of this donor consortium, came to be known as the "Mapping Exercise on Water Logging." Water logging is a specific and concrete problem, which in Bangladesh is often claimed as a particular manifestation of sea level rise. Yet it also sits at the intersection of a wide range of social and ecological issues, and thus the Mapping Exercise took up water logging as a kind of proxy for investigating these compounded concerns throughout the region.

The discursive and epistemological morass that grew out of the Mapping Exercise is an object lesson in the politics of uncertainty in Bangladesh, particularly in relation to the practice of claiming uncertainty within the adaptation regime. By the time I began asking questions about the study in spring 2014 in private conversations and interviews with donors and consultants participating in the process, it was already clear to all of the donors and development practitioners involved that they had inadvertently wandered into a tense and awkward political terrain for which, a draft report claimed, "no elegant solution exists" (FAO 2015, 92). "Elegance," in this

sense, is a euphemism for political convenience, not for scientific or physical capacity. At the heart of this tension are the paired uncertainties over what exactly is causing water logging and, subsequently, what the solution is.

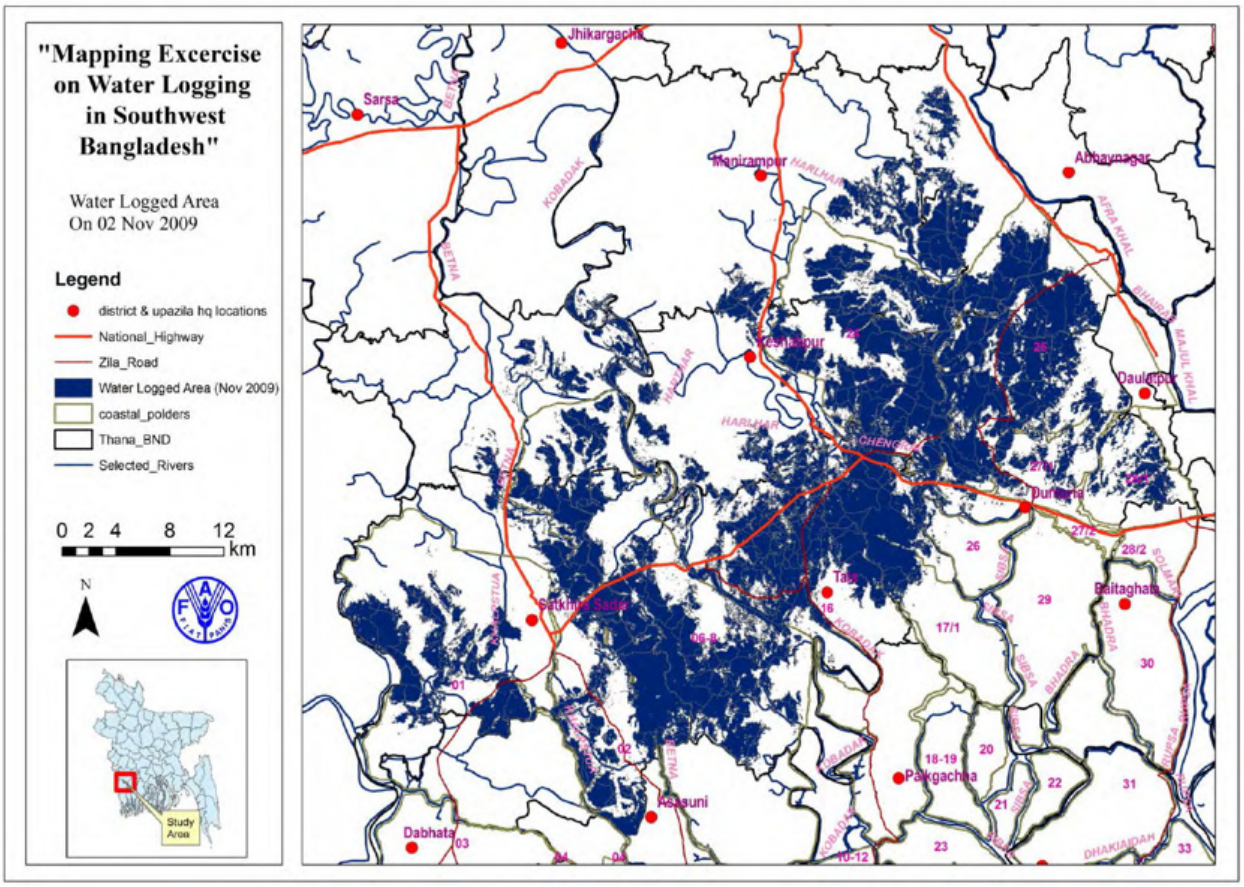

Figure 29. Map of water logged area in Khulna as of November 2009. Source: (FAO 2015)

The Mapping Exercise motivated a series of uncomfortable conversations about what is really driving water logging and disagreements over what the actual problem is. Though sedimentation of rivers and subsidence of the land inside the polders has facilitated water logging, impediments to drainage are usually related to conflicts between rice agriculture and shrimp aquaculture. Specifically, irrigation and drainage canals are often blocked by shrimp producers in order to keep saltwater inside embankments, and the canals themselves are often grabbed for use

as shrimp *ghers* (ponds), preventing farmers from flushing out stagnant water.[74] The land use and tenure arrangements involved in these conflicts are marked by tremendous inequity, compounded by the fact that in most cases those involved in occupation of land and canals for shrimp cultivation are political and economically influential and enjoy the support of political elites and often NGOs.

The political economy of land tenure and water management in these communities thus drives the water logging problems they are experiencing. It also shapes the way the issue is understood. While water logging is a significant problem for some - specifically agriculturalists, day laborers dependent on rice cultivation, and those displaced from homes in lower-lying floodplains - for others, those who benefit financially from the expansion of shrimp, it is an opportunity and a boon. So, while water logging has been identified as an intractable humanitarian crisis, the Mapping Exercise revealed that the failure to address these underlying political economy issues was what has prevented a solution from being reached. The conversation over water logging itself became contentious because it entailed identifying political issues that donors and policy makers did not want to discuss openly. One consultant acknowledged to me that the "big issue" was how to have a "straightforward" conversation, "because this is not about rational solutions to water logging. This is about who owns what." Indeed, the Mapping Exercise revealed uncertainty and disagreement over whether water logging itself is even a problem - one project member told me "our aim is not solution minded," explaining that they intend to address "the negative consequences of water logging, not water logging itself, per se." I understood this to mean that if the "root causes" of water logging were found to be politically inconvenient, then donors would respond by instead finding ways to manage the fallout of the decision not to address

[74] There is also evidence that rapid deforestation for shrimp farming has contributed to increased erosion along the river banks, resulting in an increased sediment load in the rivers and resulting in increased siltation in the distributary channels around the polders (Deb 1998).

those “root causes.”

The practice of claiming uncertainty became a primary strategy through which donors managed this uncomfortable political landscape. Despite recognition among most if not all participants that these political economy dynamics were driving the ongoing water logging issues, they retained a shared account of uncertainty to avoid a collective recognition of this. Even as the research conducted under the Mapping Exercise illuminated the role of shrimp aquaculture in causing and exacerbating water logging, claims of uncertainty coupled with references to climate change allowed donors and practitioners to ignore these apparent drivers of change. While donors have continued to refer to their associated activities in the southwest as “climate-related,” if not specifically designating them as climate change adaptation projects, in private conversations they often question this official narrative, and recognize non-climate drivers. One donor described to me a private meeting among EU member states in Bangladesh to discuss the ecological challenges facing the southwest in which participants discussed the role shrimp aquaculture plays in generating degradation. According to this donor, the discussion involved an examination of whether the fact that the EU imports roughly 50% of Bangladesh’s shrimp exports means that the EU, both through trade and support through development programs investing in aquaculture expansion, bears some responsibility for ongoing environmental transformations. However, such analysis makes no appearance in any public reports or statements, and when I asked other participants in this private meeting about this discussion, they were evasive (without denying the conversation or the concerns). The conversation at this private meeting, then, and the donor’s comments to me afterward, represent moments of fissure in these practices of uncertainty.

The draft report of the Mapping Exercise mentioned above languished as a “DRAFT FOR CONSULTATION”, with some participants saying it would always be referred to as a “draft” indefinitely to allow space for such equivocation. Nevertheless, it provided a roadmap for

planning and coordination of activities among concerned agencies in subsequent phases of the Mapping Exercise. Toward the end of the report is a table mapping the responsibilities of various agencies and activities that could be undertaken to fulfill them, summarizing the key conclusions of the exercise overall (see Appendix A). The table, regularly referred to obliquely by participants as "the matrix," reflects these fundamentally contradictory activities and objectives. This is manifested most clearly in its simultaneous recognition of aquaculture's role in water logging along with proposals for facilitating aquaculture expansion. For example, it (somewhat obliquely) recognizes the problematic blocking of public drainage canals for aquaculture ghers where it lists government responsibilities as "removing illegal and unplanned structures" and "adopt policy to limit leasing of rivers/canals, and implement." This also reflects the challenge faced in addressing water logging that government authorities are often complicit in blocking drainage to create shrimp ghers, either overtly leasing them out, or implicitly authorizing them through non-interference with "illegal" dam structures. Yet, it also lists a series of potential aquaculture support interventions, such as "create 'clusters' covering enhanced 'agro-aquaculture,'" and "adoption of other suitable technologies in the crop shrimp." These contradictions reflect disagreement over what the problem is and tension over mandates and conflicting goals. Moreover, in suggesting that local government authorities could take responsibility for mitigating these legal or illegal land and canal occupations, the Matrix ignores the imbrication of political and economic elites. In the text of the report, it lists local Members of Parliament, Union Parishad Chairmen, and other local political leaders and civil service officials as among those opposing certain water logging mitigation efforts, due to their investments in shrimp aquaculture.

These contradictions are inherent in the approach of the report itself in explicitly avoiding the politics driving the water logging crisis in the southwest. "The matrix does not analyze," one consultant told me. Importantly, it fails to provide a coherent vision for eliminating the water

logging problems that the Mapping Exercise theoretically aimed to address in the first place. By retaining a collective account of uncertainty concerning the drivers of water logging, donors thus are able to avoid taking steps toward mitigating them.

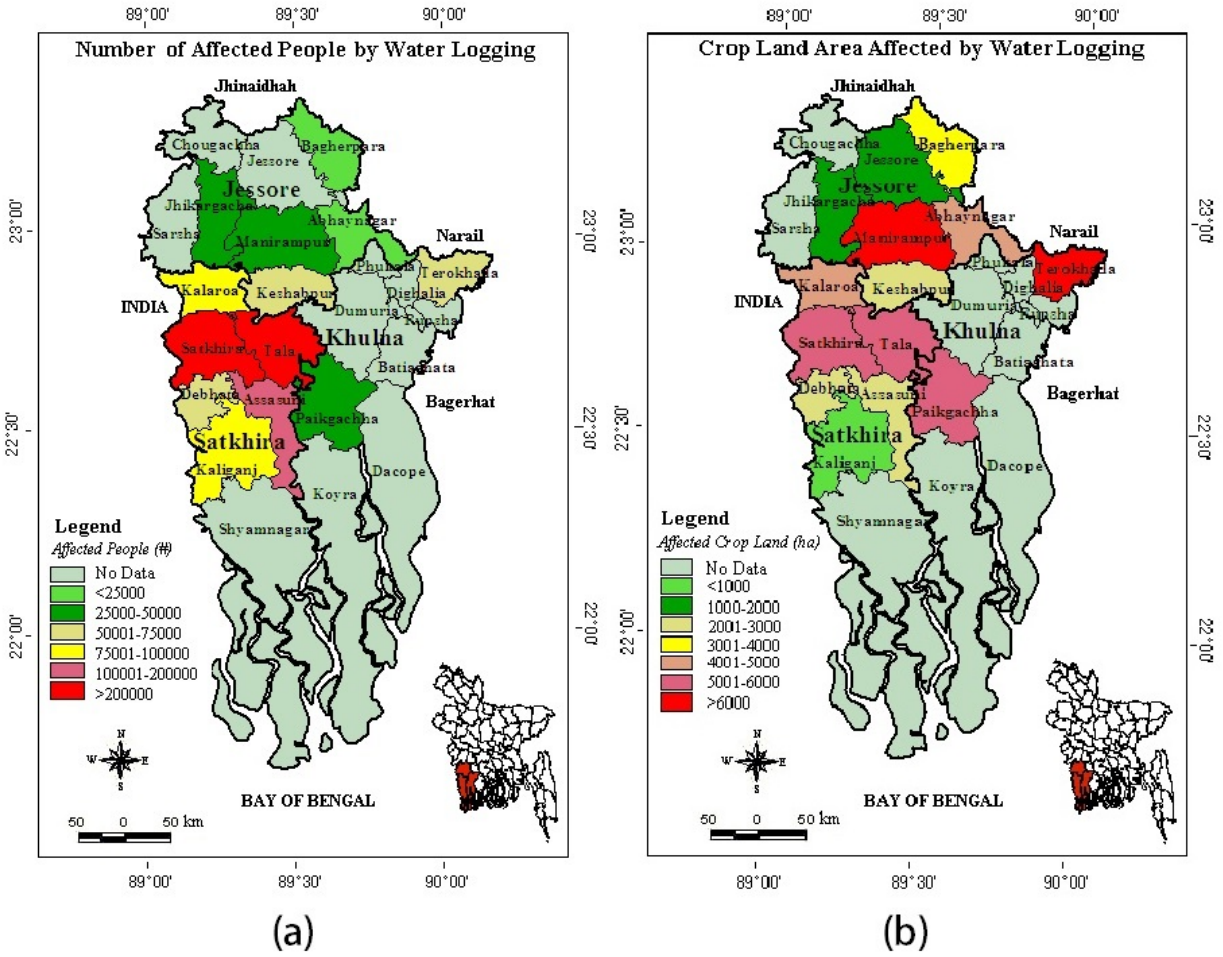

Figure 30. Map of Waterlogging in Khulna and Shatkhira Districts. Source: (Awal 2014)

The Mapping Exercise illuminates the role uncertainty can play in the process of what Tania Li refers to as "rendering technical," the enframing of a field of intervention appropriate to the kinds of solutions that experts already have to offer (Li 2007). The Mapping Exercise rendered technical the problem of water logging by understanding what the problem was only in relation to available solutions. Crucially, uncertainty was employed to evade available solutions that these experts deemed to be undesirable. As the problem of climate change is rendered technical, the

constant production of scientific knowledge about its effects in the southwest produces a particular field of intervention. Yet, where the normative developmentalism of the adaptation regime limits the scope of possible strategies for addressing these changes, uncertainty is deployed to delimit a broadly vision of possible futures for the region.

I gained firsthand insight into how these competing concerns around water logging are negotiated through a project managed by UNDP. I had originally gone to meet with a staff member there involved in the Mapping Exercise, to learn about the UNDP's work with the study and interventions designed to mitigate the impacts of water logging. While I was there I learned about a pilot program they were calling "TRM++," which they planned to implement in Khulna's Tala subdistrict (see Figure 30: Tala is bordered to the east by the subdistricts of Paikgachha and Dumuria, field sites explored in greater detail in Chapters 5 and 6). TRM stands for Tidal River Management, which refers to a vaguely defined set of strategies for mitigating water logging impacts within the polders, broadly targeted at temporarily opening up sections of embankment to selectively reintroduce tidal flow. The goal is to raise up the land elevation by facilitating the accretion of sediments on lowlands through intentionally flooding with sediment-rich tidal water.

The history of TRM strategies are generally traced back to an incident in Beel[75] Dakatia, a marshy lowland in Polder 25 that in 1982 began to suffer from drainage congestion and chronic water logging related to technical issues with the polder system (described in Chapter 1) (Rahman 1995). By 1990, Adnan writes that 40,000 acres of land and homesteads in Beel Dakatia were continuously under water (Adnan 2009, 113). In response, local farmers, having identified the problem's relation to the embankments preventing tidal sediments from being deposited on and building up their land, organized a mass mobilization to breach the embankment and allow the

[75] There are several words in the Bengali language used to refer to marshy lowlands or wetlands, including *beel, haor, baor,* and *jheel*. There is little technical difference between them. "Beel" is the word primarily used to refer to such lowlands in southwestern Bangladesh.

water from the river to flow inside the polder. Their strategy was at least partially successful – with tidal activity resumed, sediments flowed freely into the polder, rapidly building up the land. By 1992, Adnan observed, at least 2,500 acres of land had resurfaced, and farmers had resumed rice production (Adnan et al. 1992, 52). Shortly thereafter, however, the government stepped in with a new intervention to address the infrastructure and drainage issues in Polder 25, which involved plugging the cuts that farmers had made in the embankment.

Subsequently, TRM has gained a kind of cult status, celebrated as a potential remedy for problems created by the polders that relies on unique local knowledge (Khadim et al. 2013; Shampa 2012; Hossain, Khan, and Shum 2015). The pioneering work of farmers in Beel Dakatia to forge this experiment makes it a popular idea with activists, while it is also occasionally discussed in development circles as a potential low-cost compromise to address the problems with the polders without completely dismantling them. However, this celebration of the potential of TRM notwithstanding, widespread adoption in development planning has been thwarted due to the challenges of replicability. Not every water logged area is physically suitable for TRM, dependent largely on the proximity and path of the river channels to the area to be raised (if the water has to come too far or take a circuitous route to the lowland, the sediment won't make it all the way, and therefore won't result in successful accretion). The process of translating the TRM experience into transferable engineering principles has also jettisoned the social and political particularities that made the experience in Beel Dakatia successful (Islam and Kibria 2006). Its implementation is very slow, messy, and requires concerted efforts at collective deliberation and action. These characteristics make TRM difficult to translate into concrete development programs, with their strict and limited timeframes and predetermined goals and objectives. Specifically, farmers in Beel Dakatia had forged a consensus on returning their land to rice cultivation, and TRM facilitated the change in water regime required for this. However, a lack of consensus on what to produce may

also involve a lack of consensus on the amount and scheduling of water availability. As noted in the discussion of the Mapping Exercise, those interested in cultivating shrimp may regard as favorable the same flooded conditions that rice farmers regard as inimical to production. Moreover, attempts of development agencies to put TRM into practice have been confounded by the challenges of how and who to compensate for lost production revenues during the period during with the land is forcibly inundated (van Staveren, Warner, and Khan 2017). These challenges and limitations of TRM in particular places have led researchers and development agencies to focus their energy on pursuing other more "comprehensive" water management strategies with broader potential for replication (Auerbach et al. 2015b).

The UNDP's TRM++ project intended to address these deficiencies in previous attempts at replication. The program's official documentation listed the intended outcome of the program as "By 2016, populations vulnerable to climate change and natural disaster have become more resilient to adapt to risks" (UNDP 2014). In the early stages of implementing the project, they asked me to go visit the village where they were implementing it, as they were looking for assistance in documentation and analysis of the process. Extoling the project's innovative features before I went to see for myself, the UNDP staff told me at length about the "community consultation process" focused on the landless and the poorest villagers. They described their intervention as primarily "social mobilization" with "some physical aspects." The idea was essentially to choose a suitable TRM site, and then through consultation with the community to financially compensate the landowners for the crop loss during the seasons when the land had been intentionally flooded, but to allow the poorest community members (landless people and sharecroppers) to fish in the flooded wetland while it was under water. Thus, the landowners would be compensated for the lost earning potential from their crops, while the agricultural laborers would be compensated for the lost wages through earnings from fishing income. One staff

member explained to me "our key interest is around the social engineering of it," and in demonstrating to the government that they can "get more social feasibility out of TRM." While I was apprehensive about the conflation of "social engineering" and "social mobilization," as I understood it, the goals of the program were to address the environmental impacts of the polder system with sensitivity to their intervention's social impacts. I agreed to go check it out.

UNDP had commissioned physical, environmental, and socioeconomic baseline studies of the proposed project sites prior to initiating work there, carried out by faculty from Dhaka and Khulna Universities (Khulna University 2014; University of Dhaka 2014). Having read their richly detailed reports before arriving, I had learned that there were two sites being considered for the TRM++ project. The physical baseline study clearly demonstrated that one of the proposed sites would be a suitable option for implementation of TRM, as it is located directly adjacent to the river, and the velocity of the water flowing in from the river would carry a substantial amount of sediment to the currently water logged lands. The other site under consideration, according to the report, was not suitable for TRM, as its physical geography separates it from much of the tidal influence. It is located 770 m from the river, and water would be forced to travel to the site through a narrow canal with several angles, all of which would reduce the velocity of the water and its capacity to carry sediment to the beel (University of Dhaka 2014, 26). However, the reports also indicated that while local agriculturalists (landless laborers, sharecroppers, and land owners) in the suitable site were in support of TRM, as it would restore their lands for rice cultivation, the plan faced opposition from a small group of elites, who had leased the waterlogged lands (in some cases forcibly) to cultivate shrimp. These people, referred to in the reports as *gher* businessmen or *gher* owners, opposed the project because raising the land to make it viable for agriculture would undermine their ability to continue cultivating shrimp (Khulna University 2014, 38). As observed in the Mapping Exercise, for some people in this community, waterlogging was a threat to their

livelihoods, while for others, it was a source of economic opportunity. The site that was unsuitable for TRM didn't suffer from these same conflicts because they didn't have *ghers* there. Being so far from the river, it was difficult to transport sufficient saltwater there for shrimp cultivation. This made agriculture the only option.

Given this assessment of the technical feasibility of the intervention, I was somewhat surprised to find out when I arrived in Tala that only the site determined unsuitable for TRM had been selected for its implementation. The local staff explained to me that they had decided not to pursue the work in the suitable site because "there was a lot of complexity." As I probed further, I learned that there were about 100 land owners in the suitable site, all of whom were in support of the TRM intervention, but there were also 10-15 *gher* businessmen who were not landowners but who leased all of the waterlogged land for shrimp cultivation. "The businessmen didn't want to stop their *gher* business. They were also very influential," I was told. Faced with this opposition from influential businessmen, the project staff decided to give up on the suitable site, and redirected their efforts to the other site, despite the prior determination that its physical conditions made it unlikely that TRM would succeed there. "Ok, it is true," the project staff explained to me, "the canal will get silted up [again] within a few years, so it is not a permanent solution." Nevertheless, the TRM intervention would be more political convenient there because there were no *gher* owners opposing it.

Before I went to visit the project site, the staff told me about Bablu, a resident of the village who was described in turns as a local farmer and the founder of a social welfare NGO that sought to help the village's poor residents. Because of his position, he was the primary contact for the project staff, and was organizing local residents who would become its beneficiaries. When I met Bablu on the way to the beel, I immediately noticed his watch, his unblemished attire (including pants, not the traditional *lungi* sarong of a farmer), and his motorcycle. There could be no doubt

that he was not a member of the landless population I had been told about before I came. Both Bablu and the program staff were clearly unsettled by my request to spend the day walking around the village alone talking to people. They wanted to serve as intermediaries, and didn't think more than half an hour would be necessary to see everything. It shortly became apparent to me why this was the case, as my conversations in the village revealed serious discrepancies between the project's implementation and its vision as it had earlier been described to me. The inconsistencies were clearest when I crossed the canal to a patch of land where I found the humblest homes in the village. While the beel itself was flanked by brick *pucca* houses on large plots, often with gardens, the houses on the other side of the canal were all constructed of mud and corrugated metal, in various states of disrepair. This was where the landless people lived. Most of them worked as agricultural laborers and supplemented their income with other migratory work, such as working in brick fields and collecting honey and other resources from the Sundarbans. A clear consensus emerged as I walked from house to house talking with these residents – most of them had not heard of TRM or of the UNDP project. "No, they haven't talked to us," one man explained to me, "the NGO people come talk to the *boro lok* (elites), then they make decisions, do whatever they want." Those who had heard about the TRM project and those who I told about it were convinced that the poor would not be its beneficiaries, as had been described to me at the UNDP office in Dhaka. When I asked about Bablu's social welfare work, several of these residents laughed at me – "he doesn't help the poor, he is just a large landowner," one man explained.

This unilateral exclusion of the village's poorest residents was confirmed at the end of the day when the UNDP staff arranged a meeting for me with the people they described as program beneficiaries taking part in the "social mobilization" process. Of the approximately 25 beneficiaries present, none of the landless people or day laborers I had met during my day in the village were in attendance. I asked them to go around the room and tell me what kind of work

they did. They were all landowners. Several of them were businessmen, including two jewelry store owners, and proprietors of a meat shop and a convenience store. As we discussed the plans for economic activity in the beel during the wet season when it would be flooded through the TRM intervention, they said they planned to lease it out for others to fish in. When I asked what they thought the landless people (who were not the program beneficiaries) would do during this time, they looked back at me blankly. They could take microcredit loans, one man suggested.

It would be easy to dismiss this as a case of faulty program implementation and elite capture of a development intervention. However, the decision to reject the first site suitable for TRM and the role of Bablu and wealthy landowners in the second site suggest that accepting (even entrenching) the power of local elites was foundational to the program itself. Despite obvious concern in the program's conception and formation for the impacts of waterlogging on the poorest, the program repeatedly declined opportunities to directly address local power imbalances. In refusing to unsettle and ultimately choosing to work within these existing power structures, the program failed to mitigate the effects of these unequal agrarian political economies, despite the obvious interest of the poorest residents of both communities.

A couple months after my visit to Tala, I saw a Bangladeshi friend who works at a university in Dhaka and has also conducted research for several years in Paikgachha. He told me that he had been hired for a consultancy to evaluate the TRM++ project. I told him that I had visited the project site in Tala myself, and began to convey some of my concerns to him. He interrupted me, saying he didn't want to know what was wrong with the project. Reminding me that many faculty members at Bangladeshi institutions are paid so little that they depend on consulting contracts to supplement their livelihoods, he told me that my perspective on the problems with this project was a luxury he couldn't afford. He said he felt that if he articulated these criticisms about the program, he may not be hired for further consulting contracts in the

future. When I pressed him on this, saying I thought we both had a responsibility to sharing with each other, and to the transparent dissemination of information about development interventions in our shared field site, he abruptly got up and left the room. Once I got past some self-righteous indignation about his refusal to recognize my concerns, I realized that my friend's point about the unequal structures of research funding and compensation was fundamental to the dynamics of knowledge production in Bangladesh today. Indeed, these dynamics, of who has the choice to say what and know what, fundamentally shape the politics of uncertainty.

This example of the TRM project speaks to a wider concern with the exercise of knowledge about designing and implementing effective intervention, and with the politics of adaptation. As the diverse experiences in Beel Dakatia and Tala demonstrate, TRM itself, like any technical intervention or adaptation strategy, does not possess a fundamental politics. Its politics is shaped by the communities where it is practiced, the relationships within them, by whose interests it does and does not serve. It is only through decisions about how to respond to these dynamics that the politics of TRM is manifested. In choosing to ignore the role of these socio-economic factors, the program also failed to effective address their environmental consequences. As the knowledge about the potential for TRM in Tala traveled (from the historical experience of Beel Dakatia through the baseline studies carried out by researchers at Dhaka and Khulna Universities, to program design and implementation), details about what success would look like and how to achieve it were both eliminated and transformed. Through this process of translation, uncertainty was mobilized to shape the use of TRM in a particular way, ultimately failing to address the social and economic factors that might have made the TRM++ approach successful in mitigating both waterlogging and inequality together.

Timeframes

One of the primary ways that the sense of inevitability of climate change is produced is through the uncertainty concerning timeframes of potential and predicted impacts of change. The uncertain timeframe bleeds into a muddled sense of how these "inevitable" changes will take place. Are they already happening now? If so, is there anything that can be done about them? What are their antecedents? Are they, too, inevitable?

	Economic	**Environmental**
Global	**"A1"**	**"B1"**
	- Rapid economic growth - Low population growth - Rapid introduction of new/efficient technologies 1.4-6.4°C global warming .2-.59m SLR	- Low population growth - Transition to service/information-based economy - More clean/resource-efficient technologies - Emphasis on global solutions to economic, social, environmental problems - Improved equity 1.1-2.9°C global warming .18-.38m SLR
Regional	**"A2"**	**"B2"**
	- Very heterogeneous - Self-reliance/preservation of local identities - High population growth - Economic growth and technological change slow and fragmented 2.0-5.4°C global warming .23-.51m SLR	- Emphasis on local solutions to social, economic, environmental problems - Moderate population growth - Intermediate economic development 1.4-3.8°C global warming .2-.43m SLR

Figure 31. Summary of SRES: global scenarios of greenhouse gas emissions with projected global average surface warming and sea level rise by the end of the 21st century. Based on Storylines and data extracted from (Stocker et al. 2013; IPCC 2007; Nakićenović et al. 2000)

Uncertainty over timeframes of change is the result of uncertainty over both global and local dynamics of environmental change. In accounting for global climate change, most studies employ the greenhouse gas emissions scenarios produced by the IPCC in the Special Report on

Emissions Scenarios (SRES).[76] The four scenarios produced by the SRES reflect different possible global futures in the time of climate change, which it characterizes as divergent "storylines." These different storylines are distinguished by trajectories of global geopolitics, demographic, economic, and technological change, and accompanying projections of greenhouse gas emissions. A summary of these different scenarios in Figure 31 demonstrates the translation of global and regional political regimes into specific metrics of aggregated global environmental change (including average surface warming and sea level rise).

When these four different future emissions scenarios are applied to projections of future conditions at the local level, their impacts are often quite different. An example of projections of future salinity in the coastal region is instructive. Researchers and practitioners studying these changes in the coastal region often create maps of the movement of the saline frontier (examined above). Salinity is measured in parts per thousand (ppt); it is considered sustainable to irrigate with water up to a salinity measure of 4ppt without excessive adverse impacts on crops, still allowing for monsoon leaching without residual soil salinity (Clarke et al. 2015). One group of ESPA researchers mapped projected salinity fronts in the year 2050 of 2ppt (considered "slightly saline," but sustainable for agriculture) and 4ppt (considered the highest possible salinity level for dry season irrigation.[77] These researchers selected SRES scenarios B1 (which they consider most benign) and A2 (which they consider aggressive and extreme). As shown in Figure 32, the *worst case* scenario of A2 affects a much larger region in the 2ppt map, while the salinity front is relatively similar in all scenarios in the 4ppt map. Relative to the current salinity conditions, the

[76] In 2013, a new IPCC report replaced the scenarios outlined in the SRES with new Representative Concentration Pathways (RPCs), which reflect a larger set of mitigation scenarios, emissions, and associated warming (Stocker et al. 2013).

[77] These studies map the sustainability of dry season agriculture, not monsoon season agriculture. The latter, which is the most common crop in the coastal region, is considered less susceptible to these salinity fronts, given the availability of abundant fresh water for irrigation during the monsoon.

most benign scenario of B1 represents a relatively minor difference from current conditions in both the 2ppt and 4ppt maps.

A World Bank blog post on the topic of climate impacts in coastal Bangladesh used the same data to produce the map in Figure 33 (Dasgupta 2015).[78] The map features only the 2ppt saline front (considered sustainable for continued dry season agricultural cultivation), in which the worst case A2 scenario projects relatively dramatic change. These different depictions of similar data demonstrate how global climate change projections can be applied to suggest different possible futures for coastal Bangladesh. In this case, the scenarios suggest different perceptions of the possibility of continued agricultural production in much of the region.

However, analysis of potential timeframes of change becomes more more complex when models attempt to account for the broad range of local drivers of change that affect the same dynamics. As described earlier in this chapter, soil and water salinity in the coastal region is impacted by myriad other local patterns, which have the potential to interact with these global scenarios in a wide variety of ways. Thus, potential future scenarios proliferate rapidly in attempts to integrate global and local scenarios of future change. In another ESPA study, a group of researchers attempt to model local transformations (such as crop simulation and demographic changes) at different temporal scales, from daily to decadal time periods, and use these models alongside the SRES projections. Accounting for these local dynamics, they project limited change in agricultural production in the period until 2050, largely due to projected productivity increases of hybrid seed varieties (Lázár et al. 2015). The study highlights that global projections do not necessarily interact with local projections in predictable ways, and thus understanding timeframes of change is subject to uncertainty about the future at multiple scales.

[78] Both studies employed data produced by a study carried out by the World Bank (Dasgupta, Kamal, et al. 2014).

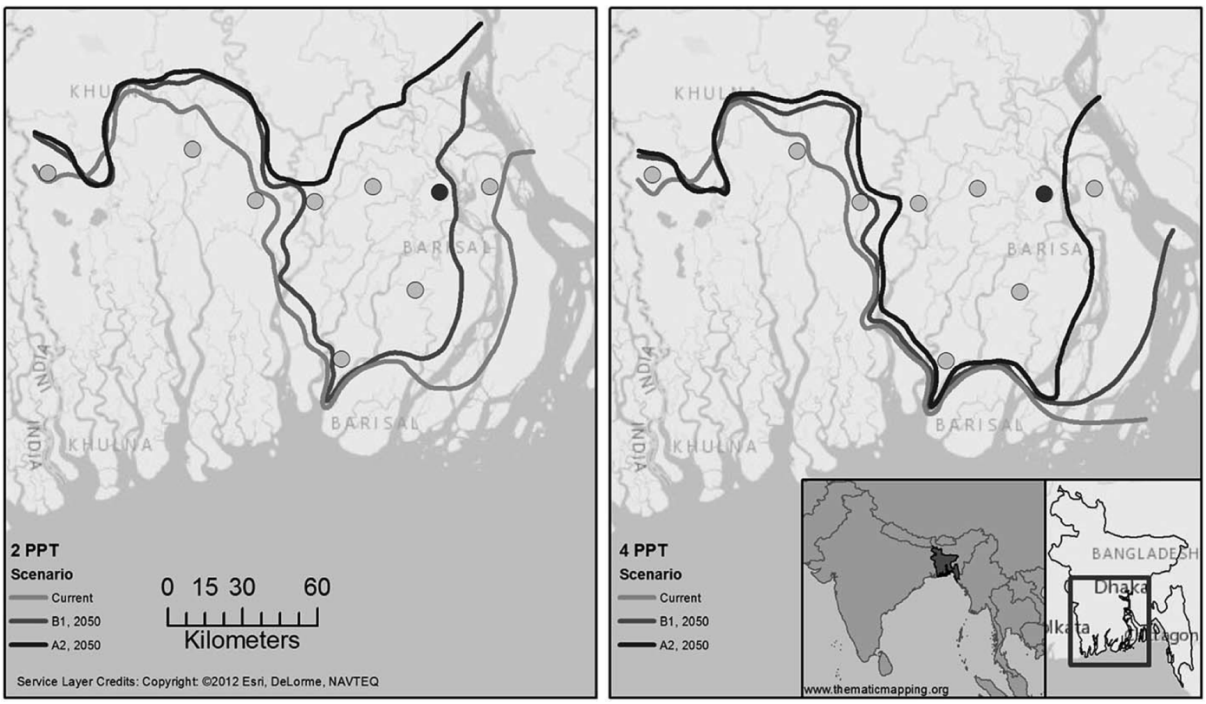

Figure 32. Dry season salinity fronts in southwestern Bangladesh under best and worst case global greenhouse gas emissions scenarios B1 and A2. Source: (Clarke et al. 2015)

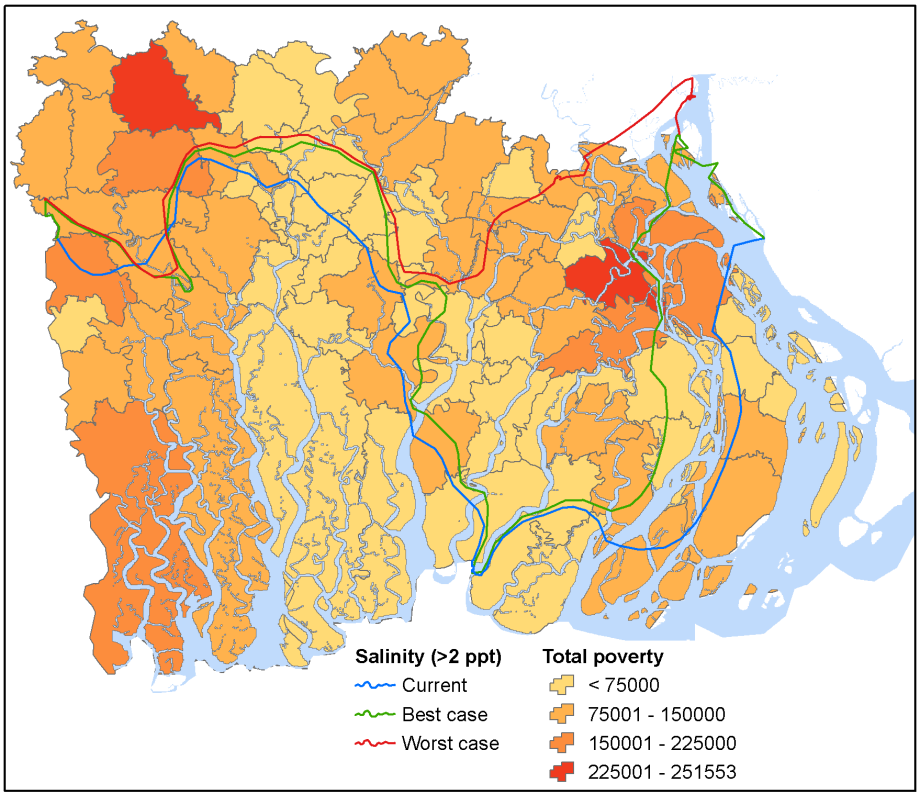

Figure 33. World Bank blog map of possible salinity frontiers in the year 2050. Source: (Dasgupta 2015)

For donors and development practitioners, however, the details of these local scenarios of likely change are less relevant than timeframes for action. When they speak of timeframes, it is in relation to investment and risk. Thinking in terms of different timeframes suggest different frames of action. Thus, one DFID official described the timeframe for incremental adaptation (explored further in Chapter 6) as 0-5 years, meaning that they anticipated limited long-term impact of these interventions. In contrast, while talking with a World Bank administrator about the depolderization examined in Chapter 3, he explained to me "if you don't think about it in the 100-200 year timeframe, you're just going to be thinking about building up the embankments. But most of our work is about thinking in the long-term." For these donors, each of these timeframes for imagining the future results in dramatically different kinds of possible intervention.

The fuzziness over whether or not we are already observing the effects of climate change in the coastal zone facilitates perhaps the greatest opportunities for claiming uncertainty about the ongoing ecological changes in the region. Sometimes specific data are pointed to in order to indicate that it is already happening, such as current rises in salinity being taken as an indication of climate-induced sea level rise. Other times, however, the same data is interpreted (often by the same people) as indicative of what the effects of climate change *will* be when they do take place sometime in the indefinite future. These different interpretations are a matter of constructing narratives about how to think about climate change, and employing available data about environmental change in service of these different narratives. In this case, the claim that "it hasn't happened yet, but it will happen" takes on new force through the assertion that the southwest is currently experiencing changes *like* those that will result from climate change, and therefore we can know what will happen and how people will be effected regardless of the real drivers of changes currently being observed.

If this convoluted logic is difficult to follow, its implications are more clear when it comes to planning particular interventions in light of these uncertain timeframes. In the case of converting land use from rice to shrimp, the claim of uncertain timeframes lends weight to the argument that even under predicted scenarios in which rice agriculture comes under threat due to climate change in some 50-100 years, it is important to begin preparing communities now for changes that will inevitably come later. In the case of shrimp, this process of preparing for the "inevitable" becomes a self-fulfilling prophecy, when aquaculture produces the ecological impacts for which it is proposed as an adaptation solution.

What is more, the opportunities afforded by adaptation are themselves offered as an excuse for uncertainty, and rationale for avoiding attribution of drivers of ecological change. One scientist working for a large development agency involved in promoting shrimp aquaculture explained to me that in the southwest, "there is an incredible amount of adaptation going on constantly," continuing that whether degradation through salinity is caused by rising sea levels or the intentional flooding of land for shrimp production, "it almost doesn't matter, as long as people can adapt." Clearly whether it matters or not is a political rather than "scientific" concern.

Rice, Shrimp, and Migration

As uncertainty about ecological change in the southwest is often claimed, it is also actively produced through particular development discourses and research practices. Though claims to uncertainty as described above also clearly serve a purpose, in this section I refer to those practices through which uncertainty is produced through the act of knowledge production itself. Uncertainty about conflicts over shrimp production and uncertainty over rural out-migration are two areas where these practices are manifested most clearly, and I turn my attention to them below.

While donors, development practitioners and researchers claim uncertainty over the interface between the ecological impacts of shrimp aquaculture and those of climate change, when it comes to the social implications of shrimp, uncertainty is actively produced by these same actors. Often this production takes place in the interstices of claims to authority over decision making and gaps and evasions of translation between local and international actors.

Though the conflicts between shrimp and rice are usually actively ignored by concerned donors and policy makers, when they are raised, these actors respectively demur, claiming a lack of responsibility or influence over the political economy of production in the southwest. Donors and foreign development practitioners claim that knowledge and responsibility concerning these conflicts lies with the government, while civil servants working for state agencies claim it is for the donors supporting aquaculture programs to investigate and address such claims. In one interview with an official at the Bangladesh Department of Agricultural Extension (DoAE), I was told that the the DoAE doesn't get involved in conflicts over rice and shrimp unless farmers are interested in making the shift to shrimp, in which case they may provide support. Otherwise, it is the responsibility of donors to assess the costs and benefits of shrimp production, as "assessment" requires money, which donors manage and allocate. The official claimed to me that the DoAE possesses technical expertise in production technologies, but does not have additional expertise in the kinds of "assessment" that require economists, sociologists, and other experts, work that he believed donors are uniquely suited to support and initiate. The official cited the Mapping Exercise as one example of donors funding and making decisions about what will be examined about ecological change and development, as well as how such assessments will be carried out. In this sense, the official highlighted how decisions over what will be understood and what will remain uncertain are actively shaped in the development planning process.

For their part, donors uniformly dismiss responsibility for evaluating or addressing the conflict between shrimp and rice, which one foreign development practitioner involved in a major USAID-funded shrimp aquaculture program referred to as "just personal local fights."[79] In another conversation, when I asked a question about “land grabbing” for shrimp production, another practitioner corrected my phrasing by saying “you mean ‘multi-ownership.’” I subsequently heard this linguistic conceit of “multi-ownership” repeatedly – it is seemingly aimed at obfuscating the power dynamics embedded in these “multiple” claims to land at the frontier between shrimp and rice. This diminution of the significance of these conflicts and of the role they play in the expansion of aquaculture production reflects the selective mobilization of knowledge about land relations embedded in shrimp cultivation.

Although the dynamics of land under shrimp cultivation in Bangladesh have long been brought to the fore by activists in public discussions both locally and internationally, development policy makers frequently refer to their lack of responsibility, certainty, or understanding of the dynamics of shrimp production to defend their support of it. The *National Aquaculture Development Strategy and Action Plan of Bangladesh*, a policy document developed by the FAO for the Bangladeshi government, provides an example of this slippage. Buried in an Annex deep at the back of the document is a "log frame”[80] identifying the "assumptions and risks" of aquaculture

[79] Development practitioners recognize these conflicts and their significance with varying degrees of concern, though with a common sense of lack of responsibility. One senior diplomat from the United States acknowledged the land conflicts related to shrimp with a chortle that seemed to absolve his own office’s support of the aquaculture expansion, exclaiming “well, the mafia down there has just messed everything up!” By “mafia” he referred to the reports of land grabbing, a practice he intended to claim was not inherent to shrimp production, which could be, he said, a billion-dollar industry, if not for the malpractice of this isolated cabal. By refusing to acknowledge the complicity of aid agencies, and indeed those supported by the United States government itself, in rural dispossession through shrimp aquaculture expansion, such comments produce uncertainty about the nature of agrarian change and its drivers.

[80] A "log frame" or "logical framework" is a methodology used by international development agencies for designing, monitoring and evaluating development projects. It is presented as a table, within which the rows list activities, outputs, purposes, and goals and the columns list project description, indicators, means of verification, and assumptions. It aims to convey a sense of rational and goal-oriented project planning.

development in Bangladesh (see Appendix B). The table indicates the assumption that benefits of shrimp aquaculture to the poor and landless are predicated on an "equitable land and water allocation system." Similarly, the risk embedded in spatial planning/mapping of zones (a process examined in further detail below) for aquaculture development is "that potential resource use conflicts are not resolved among the various agencies." In both cases, these are fatal assumptions. As one donor pointed out to me in a conversation about this Plan, in a functional log frame, both of these assumptions would be "deal breakers." The failure to acknowledge these flaws - specifically, that land and water allocation is *not* equitable, and that resource use conflicts have *not* been resolved -- suggests a particular relationship to how information is assessed and incorporated into development planning. Who is responsible for addressing these concerns, and fatal assumptions, is also, then, a matter of uncertainty. Even as the FAO itself created this national planning document, it produced uncertainty about the fundamental role of this planning in shaping the equity of land and resource distribution.

Another example of this active production of uncertainty is in the epistemological politics of discourses over "climate migration," which both obscure and facilitate the dispossessions embedded in the conflicts discussed above (Hartmann 2010; Brammer 2009). In chapter 5, I explore in greater detail the normative orientation of development practitioners and donors toward promotion of climate migration as an opportunity for development in both rural and urban areas of Bangladesh. Here I examine how this is facilitated through the production of uncertainty over the drivers of rural out-migration from the southwest. Most significantly, migration that is said to be driven by climate change is also said to be inevitable (as discussed above), while migration driven by dynamics of development and land dispossession (through the transition from rice to shrimp or otherwise) suggests a different set of responses and solutions. Thus, claiming climate change as the

driver of rural out-migration without reference to other factors impedes possible responses to, and thus entrenches rural dispossession.

One research institute in Dhaka widely celebrated by donors and practitioners, with a prolific record of publications and presentations concerning climate migration, offers an instructive example of this process of knowledge production. The work of this institute to propagate discourses surrounding climate migration serves to produce uncertainty about the nature of ecological change and the demographic shifts which accompany it. Climate migrant discourses are born out of the production of uncertainty over what constitutes "climate migration" as opposed to migration taking place for economic or other reasons. This institute regularly presents projections that between 2011 and 2050, as many as 16 to 26 million people will migrate from Bangladesh's coastal zone due to climate-related stressors. These figures are cited widely among donors, development practitioners and policy makers in Bangladesh as the best projections for understanding climate migration from this region (often cited as the region that will experience the effects of climate migration most dramatically).

However, this projection, and the particular data analysis on which it is based, turns on the production of uncertainty about the drivers of migration. The methodology through which these figures were derived is based on the deployment of normative development objectives in place of clear investigation of available data. In this way, studies of migration come to be shaped by the researchers' normative understanding of the fundamental desirability of migration. Another researcher affiliated with the institute described above asked a group of development practitioners at a private meeting in Dhaka, "if we are going to promote [migration] as a climate change adaptation strategy, how are we going to do it? Do we have enough research evidence?" Thus, establishing the "evidence" that might be used in service of these goals becomes the driver of how research and analysis is carried out. In one public presentation of their findings, researchers from

the institute acknowledged that only 10% of their respondents attributed the primary reason for their migration to climatic stress. This finding is clearly at odds with their conviction that climate stress and migration are definitively linked. However, they explained that climate migrants may not be aware of the role that climate change plays in their decisions to migrate. Therefore, an alternative methodology, wherein migrants are asked what climate-related stressors they had experienced, suggested that any migrant who had experienced a "climate-related stressor" was a climate migrant, regardless of their own attribution of what had driven this decision. This strategic methodological shift was confirmed in multiple conversations I have had with separate members of the research team.

The implications of these methodological decisions to development policy are significant. Indeed, the effects of climate change are seen as intractable and beyond the control of local development policy. Therefore, if people are migrating due to climate change, there's nothing that can be done about it. That these migration patterns will only grow as the effects of climate change increase is assumed to be self-evident. And the need for people to escape these climate-vulnerable communities becomes equally self-evident. This uncertainty over the exact drivers of migration is ubiquitous in research examining climate migration around the world. The inability of researchers to ascribe any particular changes at this spatial or temporal scale to climate change leads to understandable uncertainty in drawing causal relations between climate change and multi-causal patterns such as migration. There is nothing fundamentally flawed about attempts to explore patterns in the face of such methodological gaps. However, it is necessary to be aware of the normative claims that may result from such assumptions, as well as particular practices that produce uncertainty about these dynamics. If, for example, these migrations were understood to be the result of the expansion of shrimp aquaculture, then the potential responses would be much more diverse, and perhaps less inevitable. The value of the landscape, and the communities which

inhabit it, thus shift along with the uncertainty over the biophysical dynamics shaping them now and in the future.

Zoning

One of the key tools cited by development practitioners in Bangladesh as essential to climate change adaptation is land use zoning in the coastal region. Referred to in the planning documents of donors, NGOs, and various government line ministries, project proposals, and in regular conversation among staff at these agencies, zoning is celebrated as a kind of panacea for all climate-related planning challenges. It is said to resolve uncertainty by rationalizing an otherwise unwieldy planning process, concretizing planning through the reconciliation of disparate aspirational visions through hard-nosed scientific data. Zoning is said to maximize economic benefits and to reduce conflicts of all sorts - between forests and human settlements, rural production and urbanization, and, critically, between rice and shrimp. In this sense, zoning serves to exculpate the promotion of shrimp aquaculture from critique of its negative impacts, and to insulate it from resistance.

Yet, for all the celebration of zoning as the solution to a variety of adaptation planning dilemmas, further details about the process of rationalizing what should be grown where (and why) proved to be unexpectedly hard to come by. Over the two years during which I conducted fieldwork in Bangladesh, detailed accounts of the process of land use zoning became the veritable white whale of my research, a supposedly objective but ultimately furtive science with elusive and enigmatic methodologies. My adventures chasing the secrets of this science, I believe, ultimately taught me more about the nature of the development planning process than any particular zoning map or methodology could have.

Indeed, for all of the times zoning is invoked to explain away criticism of conflict, practitioners and policy makers I talked to only described its use in this ideological sense. These zoning measures are never implemented as strict land use policies, nor are existing plans detailed enough to be put to this further use. Several different government agencies and NGOs have their own unique zoning maps held internally but not necessarily shared with other agencies. An official at WARPO (a government agency tasked with high-level water management planning) told me that he knew of distinct zoning maps produced by the NGO WorldFish, the FAO, and the Bangladeshi Ministry of Land, and an independent group of university researchers. Yet, though each of these agencies may have used these maps internally to justify where they would carry out their own projects,[81] they weren't agreed upon and they often weren't shared publicly.

The official at WARPO described these zoning plans as necessary for curbing the incursion of shrimp into lands still suitable for agricultural production, but also potentially futile. The Coastal Zone Policy indicates zoning as the means of resolving conflicts between rice and shrimp. Yet, "it is almost too late," he said to me, inferring that the conversion of land suitable for rice agriculture to shrimp aquaculture may not be able to be controlled through such governance measures. He continued, "everybody is afraid. Even the Land Ministry is skipping the responsibility. They are afraid of the moneyed people. Or they are benefitting from that money themselves." In this way, he explained, the only role of the zoning documents would be to implicitly validate the expansion of the shrimp cultivation area, in the sense that they will not control it, but they may condone it.

This is reflected in the Land Ministry's zoning map for the Paikgachha subdistrict, which the WARPO official shared with me (see Figure 34). It indicates that Polder 23 (which has already been fully converted to shrimp) is zoned exclusively for shrimp, while Polder 22 (which is still

[81] This likely for the first organizations listed, and less so for the independent researchers, although academics are often hired as individuals or departments for private consulting work, and in that context, such academic analysis can be used for project design.

entirely a rice farming area) is zoned for both agriculture and shrimp. The map thus indicates that agriculture is unviable in the shrimp zone, while suggesting that shrimp could also be possible in the rice zone. When I pushed the official for further details on the methodology for determining this land use suitability, he described with cynicism his familiarity with the process at the Land Ministry. "They were not at all serious about that," he said, "there were some fishy things going on. [They were under] very much pressure because shrimp export is so lucrative." The concerns cited by this official suggest that, contrary to being a tool of rationality and transparency, zoning is useful precisely in the opacity and uncertainty governing its production and utilization.

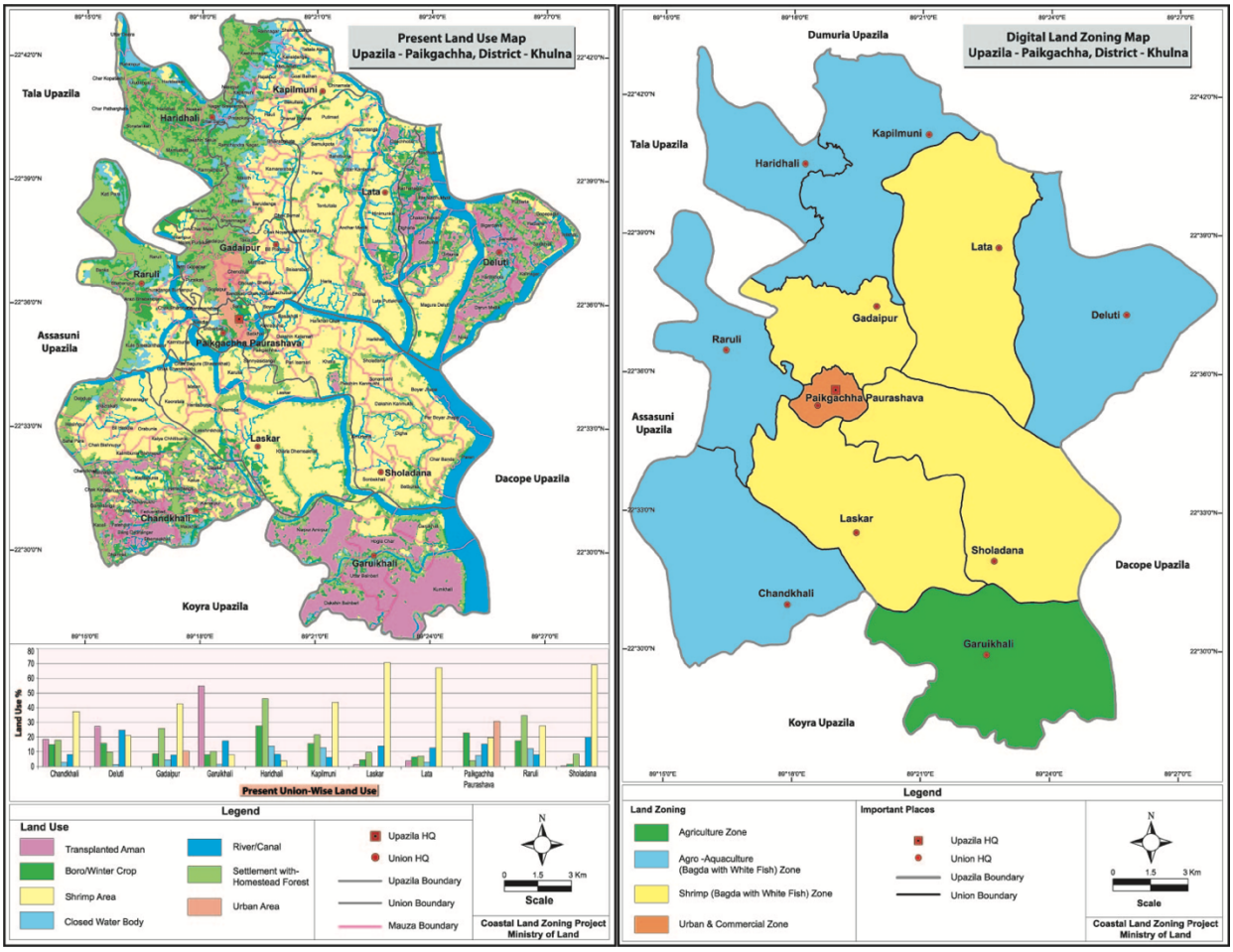

Figure 34. Bangladesh Ministry of Land Paikgachha subdistrict land use and land zoning maps

Though zoning came up repeatedly in my interviews with donors, policy makers, and practitioners, my inquiries into how zoning is carried out were frequently met with claims of

uncertainty about who is responsible, how it is implemented, and the kinds of metrics and data involved. One informant would direct me to another, who would direct me to another, and sometimes back to the original person, or more often a dead end. A project to establish a comprehensive adaptation plan for the entire delta involved developing a land use zoning policy about which no project team members I talked to could answer questions, until someone finally told me that the consultant responsible for this zoning was Dutch, based in the Netherlands, and would not visit Bangladesh (indeed, including the region being "zoned") for the entire duration of the project.

The development of the Master Plan for Agricultural Development of the Southern Region of Bangladesh is an instructive example. This document, officially produced by the Ministry of Agriculture, but prepared by consultants hired by the FAO, is just one of many "Master Plans" that seem to be constantly proliferating among NGOs, donors, and government agencies to facilitate coordination and planning for development intervention. I met several times with a senior official involved in the development of this plan, who many had described to me as an expert in zoning. Each of the three times I went to his office, I asked him to describe the zoning process, and he repeatedly told me to come back on another occasion before he was willing to say anything about how zoning decisions were made. He ultimately told me that the four major parameters used in shaping zoning decisions include biophysical feasibility, types of infrastructure already available, participant interest, and the market, though he noted that the market is usually the "first" priority. This account aligns with the discussion of zoning in the report itself, which says

> "For Khulna region, zoning for shrimp culture is important. This should be based on suitability conditioned by bio-physical characteristics of the land, current practices, emerging trends, long term market behavior, etc. Farmers can not be forced to follow what to do or what not to do. But their activities in particular areas can be regulated and streamlined through measures of incentive and disincentive." (Ministry of Agriculture and FAO 2013, 68)

This note of zoning as opportunity for incentivizing and dis-incentivizing certain production practices is particularly important. It means that zoning can help identify areas for interventions to support shrimp cultivation (including, for example, provision of credit, subsidizing inputs such as feed and fertilizer, facilitating access to markets and government land), while maintaining the idea that the choices of what to produce rests with individual farmers. As the official explained to me, zoning became an opportunity not for making strictly scientific decisions about what was possible to produce where, but instead where development agencies might implement programs to promote shrimp based on this series of normative judgements about the desirability of shrimp production grounded largely in market logics. In this way, the zoning maps attempted to instill a sense of scientific rationality in an otherwise subjective process.

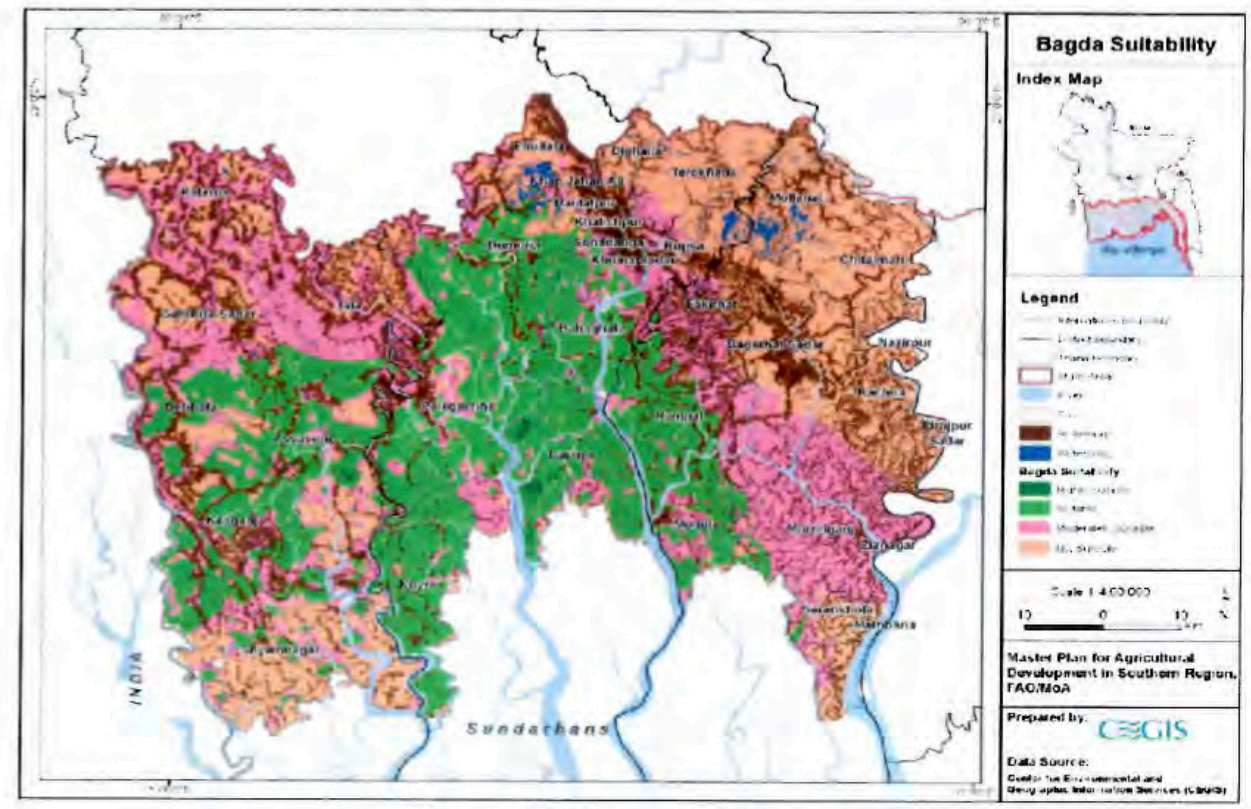

Figure 35. Master Plan for Agricultural Development of the Southern Region of Bangladesh shrimp zoning map. Source: (Ministry of Agriculture and FAO 2013, 68)

If this zoning methodology in the Master Plan was uncertain and opaque, the map itself further entrenched the unintelligibility of these plans. Figure 35 depicts the shrimp zoning map included in the Master Plan report published on the FAO's website. The indecipherability of the map's legends and labels are a reproduction of their indecipherability in the original as it was distributed to the public and to other development agencies on their website. Of the several development practitioners who I talked about about the Master Plan and this critical but unintelligible map of suitable areas for promoting shrimp aquaculture, they all agreed that it was unreadable, but that they knew it suggested that most of the Khulna region was suitable for shrimp aquaculture. The WARPO official mentioned above told me it was his understanding from the map that 80-90% of the region was suitable for the promotion of shrimp aquaculture.

These normative dimensions of the zoning process and the utility of zoning to development intervention was confirmed in an interview I conducted with a high-level government official in Khulna. After villagers in Polder 29 held a major protest against attempted land grabbing for shrimp and submitted a petition to this official asking him to intervene for protection, I had gone to his office to ask him whether and how he planned to respond. In the course of our conversation, I asked him whether the land had been zoned for shrimp or rice, and if this would have an impact on his decision. In response, he said to me "in your country, you have a lot of rules and laws. In our country, we have traditional ways of doing things. Like traffic laws – we do as we have always done. We use [zoning] publicly, but in process, we don't actually use it. Zoning is for planning. The government's role is to support the private sector with exports." Far from being a neutral science grounded in the analysis of diverse and changing ecologies, my conversations with these practitioners and policy makers revealed the normative dimensions of zoning involving particular ideas about ideal production for the region.

Indeed, these conversations about zoning indicate that often the opinions of development and planning officials that shrimp *should* be produced were often conflated with the idea that shrimp was the only thing that *could* be produced (therefore justifying zoning particular areas for shrimp). Likewise, that which *is* produced, where shrimp is concerned, is usually conflated with that which *can* be produced, though the same is not true for rice, meaning that areas that currently are producing shrimp are always zoned for shrimp, while areas that currently produce rice are sometimes zoned for shrimp, if zoning officials determine that shrimp production is possible (this is also observed in the example above in Figure 34). One official told me that in some zoning attempts, areas where land is known to have been forcibly grabbed for shrimp production from rice farming has nevertheless been zoned for shrimp because "it has to be expanded because of the economy." In zoning maps produced by the CGIAR research consortium, large areas of Khulna where farmers are currently producing rice successfully have been labelled only "marginally suitable" for rice production, but "suitable" or "most suitable" for shrimp cultivation.

Also critically, the interest of rural communities in continuing to farm rice is apparently not a determinant of the “suitability” for rice or shrimp production. What, then, is the purpose of these zoning plans? Despite claims of widespread uncertainty about how zoning is determined, I found that the *idea* that zoning exists through which rational decisions can be made conferred a great deal of power to development initiatives that claimed it. Zoning is held up almost universally as a rationale for how and where shrimp aquaculture is promoted. When I asked one senior USAID official about concerns over shrimp aquaculture increasing soil salinity (thus making land unusable for agriculture), he told me that they reserve shrimp aquaculture for areas where "it is already too late," citing zoning as the process through which they determine where it is and is not "too late" for agriculture. The disciplining work of zoning is demonstrated by a story that one former official at the Department of Agricultural Extension (DoAE) told me about a fight he had with an FAO

consultant from Rome. In planning a DoAE project that was being funded by the FAO, this consultant insisted that the DoAE promote shrimp aquaculture expansion in certain parts of Khulna where people were still producing rice (and where, the DoAE official said, farmers *wanted* to keep producing rice). The FAO consultant reportedly said that the decision had already been made to zone this area for shrimp because of the sense of its growing salinity, and thus uncertainty over whether rice would continue to be viable, and therefore that the zoning plans dictated a shift from rice to shrimp, despite the present or desired current production practices among the area's inhabitants.

As these examples indicate, ultimately, the power of zoning is more epistemological than it is practical in the sense of policy governance. Zoning inhabits a space of uncertainty over the possibility of future degradation. Within that space, it governs a transformation in production relations that is seen to be a frontier of accumulation facilitated by that gap in knowledge about the future. As zoning maps shape production transformations in the image of this dystopic future, they create the very conditions that they predict.

Conclusion

In his landmark essay, "Notes on the Difficulty of Studying the State," Philip Abrams wrote, "Any attempt to examine politically institutionalized power at close quarters is, in short, liable to bring to light the fact that an integral element of such power is the quite straightforward ability to withhold information, deny observation and dictate the terms of knowledge" (Abrams 1988, 62). Abrams draws our attention to the critical point that power operates not only by producing knowledge, but also by withholding it. Like the state, the adaptation regime derives its legitimacy from the disruption and omission of knowledge about the social and political structures from which it derives its authority. At the nexus of science and development policy, the governance of

normative perceptions of what *can* and *should* be produced, rooted in particular understandings of the ecology and how it is changing, are shaping the landscape in southwestern Bangladesh. This dynamic is critical to the expansion of shrimp production in Khulna. The existence of social movements challenging these normative claims on the landscape's production potential calls into question these politics of uncertainty.

CHAPTER 5

AUTOPSY OF A VILLAGE

I came to know Arjav when he followed me out of a tea stall. We had been sitting with half a dozen others, crowded together on a few wooden benches, drinking the smoky, wincingly bitter tea with which I began most of my mornings in this village, Kolanihat. Besides the proprietor of the tea stall, my companions were men who cultivate shrimp in small *ghers*, mostly a few acres in size. Arjav and the others were collectively lamenting the recent fall in the price of bagda (giant tiger) shrimp, which was already untenably low. Between December and the following April, the price they were earning at the market had dropped from 350 taka per kg to 300 taka per kg (approximately US$4.50 to $3.80). Just to break even, they need to earn approximately 500 taka per kg. "Loss hoye jabe" - there will be a loss this year. The mood was low and indignant. The men spoke sardonically about NGO field workers who had come to provide "demonstrations" to them of proper techniques for cultivating shrimp and improving their yields. One recent method, they quipped, involved scattering tea leaves on the surface of the *gher* (shrimp pond), in an attempt to kill off any lurking (and to the fieldworkers, unwanted) native species. The advice provided by these NGOs is not “practical,” they explained. These are techniques, they said, that are clearly dreamed up by people who have never cultivated shrimp before.

Like the others, Arjav was frustrated about the shrimp export market, about the losses that the *gher* operators would suffer in its decline. But he wanted to talk about his larger concerns about shrimp production, and what it is doing to the village and its residents. We strolled slowly along a narrow path flanked on both sides by murky *ghers*. The late-April heat, already the hottest of the year, was unabated by shade, as most of the village's trees have died in the aftermath of the shrimp boom. This intemperate heat frequently made long days working in Kolanihat feel

oppressive, relative to the other villages in which I conducted research - both for myself (a relatively fatigable ethnographer prone to improbably high volumes of perspiration, as residents were wont to point out), as well as for laborers doing much more demanding work than wandering around chatting with people and sipping tea. These laborers often complained (far more defensibly than I) about the death of the trees, which they said used to provide shade to sit and take breaks from the mid-day heat. Without them, one man said, "how will we breathe?"

Arjav has been participating in the shrimp business for about 30 years, he estimated. He lives in one of Kolanihat's few *pucca* (cement) houses, a relatively large one, which he told me he built shortly after the shrimp boom began in the 1980s with profits from a successful shrimp larvae trading business. Unlike many others in the village, Arjav has benefited materially from the transition to shrimp. His sons have continued in the shrimp trade, moving to the nearby town of Paikgachha, gaining more commercial success than Arjav himself had. They wouldn't be suited to working in the village anymore, he said--they ride around on motorcycles now and are "onek porishkar lok," very clean people, denoting their wealth and lack of inclination toward manual labor. More importantly, he explained, with the transition from rice to shrimp, without rice farming, there were no opportunities for them to work in the village, they couldn't have stayed. If his sons hadn't left, "bhat hobe na" literally "there wouldn’t be rice," meaning they wouldn't have been able to provide enough food for the family to eat, despite financial success. He also explained, with a sardonic smile, that his sons were better suited to the shrimp trading business than him because “tader puji dorkar,” literally meaning that capital is required for this work, although also implying the necessity of a capitalist sensibility. “Amar puji choto,” he said, explaining that he personally didn’t have this sensibility needed to thrive in the shrimp business. Although Arjav himself managed a relatively successful shrimp *gher*, the family depended on his sons' off-farm employment for their daily sustenance.

Figure 36. Arjav's empty rice gola *(silo)*

Despite what would appear to be a story of success with shrimp production, he tells me in no uncertain terms that he wishes they, the whole village together, could all go back to growing rice. Sitting on the veranda of their house, staring at a stand of large bamboo rice silos in their courtyard that they said had been empty for at least a decade (see Figure 36), referring to the time

when rice was growing in their village, Arjav's brother said to me "during that time, there was peace here, but now there is no peace. The peace has died."

Arjav is concerned not just about the shift this has caused for his own family, but for the entire community. He described a great exodus from the village of people leaving to find work, mostly to India: "daily, in the morning, at night, people are leaving--all the working people." This account of migration is confirmed by the rest of my research in this village and the surrounding area, as well as interviews directly with some of these migrants in Kolkata who have left this and surrounding villages. But Arjav's reflections on what this might mean for the future of the village were particularly ominous. When I asked him what he thinks the village will be like in 20 or 50 years, he told me "if there isn't rice, the village people won't be able to stay."

Arjav's story illustrates the dramatic agrarian transitions which are taking place throughout the shrimp cultivating region in Khulna. It highlights the effects of the transition from rice to shrimp not only for landless people and agricultural laborers, but also for landowners who have actively participated in the shrimp boom. It also exposes the paradox that, even as some smallholders have increasingly begun to participate in shrimp production, they see no future in it, either for their families or their communities. The resulting erasure of agrarian livelihoods and rural communities is thus a major driver of agrarian change in this region. The disappearance of rice is continually invoked to express the experience of this ruination of livelihoods. As Arjav did, residents discuss the disappearance of rice both as “dhan” and “bhat” meaning rice in its cereal form (raw or in the field) and in its cooked form for eating. In this way, they lament the ruination both of agrarian modes of production and social reproduction. As the agricultural crop at the heart of agrarian economies and production systems throughout the region, rice has sustained these communities for centuries. As the staple food of their diets, produced for subsistence as well as for selling, it has nourished their families and provided for their survival in the best and worst economic times. In

both senses, then, the continuation of shrimp aquaculture threatens the continued survival of the village and its inhabitants.

The contradictions between shrimp cultivation and rice farming are at the heart of the social and ecological transitions taking place in Khulna. Though agrarian dispossession in rural Bangladesh has been a secular process since at least the colonial period, shrimp aquaculture has entailed a pivotal rupture of agrarian political economies in communities where it is practiced. For this reason, I intentionally avoid referring to shrimp aquaculture as "farming," which denotes a particular socio-cultural structure to which the cultivation of shrimp presents a stark contrast. In this chapter, I examine this contradiction between rice and shrimp through attention to stories of residents about this loss of rice (in its multiple dimensions), and the implications to lives and livelihoods.

Chapter Overview

In this chapter, I examine these agrarian transitions taking place at the nexus of two particular dynamics in Khulna: first, the transition from rice agriculture to export shrimp aquaculture; and second, the emergence of new visions of "developed" futures in the age of climate change. Besides existing in geographic proximity to one another in this region, shrimp aquaculture and climate change adaptation are closely linked to one another through the overlap of their respective social and ecological causes and effects.

I explore these agrarian transitions through three key empirical interventions: First, I examine the ways in which shrimp and rice cultivation are antithetical to one another, and the implications of this tension to the political economy of agrarian change in this region in which they have collided. A transition to shrimp culture entails a radical transformation of the coastal landscape and the dynamics of production that have historically sustained its populations. Second,

insofar as shrimp production entails a radical reduction in labor requirements and thus people working in and inhabiting these communities, the result of the transition to shrimp aquaculture is the displacement of farmers and communities from this landscape. I explore this through an examination of narratives about this transition among those who remain, who have been impacted by the transition in diverse ways. Third, the resulting migrations out of the coastal zone reflect this process of depeasantization. I examine this migration through testimonies of people who have left Polder 23, now living in a slum in Kolkata populated by migrants from Khulna. I argue that the discourse around the impacts of climate change in this region, which has framed these migrants as "climate refugees," both obscures and facilitates these dynamics of agrarian transition. The chapter primarily draws on ethnographic fieldwork conducted in Kolanihat, a village in Khulna's Paikgachha upazila, in Polder 23. It also makes use of interview data gathered in the CBOT study carried out in 2013.

Paikgachha is an important site for understanding the growth of the commercial shrimp sector in Bangladesh, both due to the proliferation of shrimp culture in the area, as well as its role in the expansion of shrimp culture throughout the region. In 1968, consultants for USAID recommended that the government establishment a shrimp culture research station in Paikgachha, explaining their site selection by citing the damage which the nascent polder system was already causing on local production there (Swingle et al. 1969b). The drainage and salinity problems generated by the polders would make Paikgachha the perfect site for experimenting with the opportunities afforded by this ecological crisis. In 1984, the World Bank approved funds for a National Brackishwater Research Station in Paikgachha, indicating that such an institute was necessary there to take over from a research institute in neighboring Satkhira district where shrimp culture had already caused salinity levels high enough that, they concluded, crop growth was no longer possible (World Bank 1984). In addition to having been identified as an important site for

researching the potential of shrimp aquaculture, Paikgachha has also been home to a great variety of donor and NGO-sponsored development programs aimed at expanding the reach of shrimp, including major programs sponsored by USAID, the World Bank, and the Dutch government.

Figure 37. A billboard in Paikgachha for a program supported by USAID, WorldFish, and the Bangladeshi government to promote the use of shrimp post-larvae that are scientifically tested for the presence of viruses

Kolanihat

Kolanihat is one of 31 villages in Polder 23, and is home to a population of about 700 people. It is located about 5 miles from Paikgachha city, a small market town of about 16,000 people (BBS 2016b). Many of the residents of the village were landless people and marginal farmers whose livelihoods depended on sharecropping and agricultural day labor. A survey from a similar rice-producing village in neighboring Polder 22 in 1987 reported that over 50 per cent of households fell into this category of marginal laborers (Datta 1998, 31). Until the mid 1980s, most residents of Kolanihat report producing one or two agricultural crops per year, depending largely

on the elevation of their particular plot of land. *Aman* was historically the most important crop, with abundant yields resulting from the high fertility of the alluvial soil. Residents report that historically their *aman* yields were high enough to survive on the single crop throughout the year, if land was unsuited to more than the single monsoon growing season. This is confirmed by records from the colonial period that corroborate these claims of the historic importance of the *aman* yield in Khulna (Bengal Government 1898). In addition to *aman*, residents report having grown jute, sesame, mung beans, and a great variety of fruits and vegetables.[82]

This agriculture was made possible by irrigation from the river that runs south of the village, which delivered fresh (non-saline) water for 6 months out of the year. During this time before shrimp, they could extend their growing season with canals fed by the river that could be damned up to store fresh water and extend its availability further into the dry season. Before the CEP, the village also practiced a traditional form of water management known as *oshto masher badh*, or "eight month embankments," that was part of the historic village- and farm-level hydrological regime examined in Chapter 1.[83] *Oshto masher badh* was a system used throughout much of the coast in which laborers would annually build up earthen embankments to protect agricultural lands from the river, and subsequently tear them down to allow tidal inundation for the remaining four months, facilitating sedimentation and fertilization with the nutrient-rich alluvium. The system extended the growing season by protecting land from salinity and flooding, while also not being so permanent as to prevent the mitigation of water logging. The system required a high degree of cooperation between landlords and sharecroppers, who generally undertook the embankment work as a condition of their tenancies. After Partition, when many

[82] Elsewhere in Polder 23, elderly residents reported to me having grown up to three crops in a year, including an additional crop of *aus* rice, a shorter dry-season rice grown between the dry and monsoon seasons. *Aus* is typically grown on higher land, so it is less likely that it was ever grown in Kolanihat, much of which is relatively lower ground.
[83] Datta also discusses this system in a neighboring community in what is now Polder 22 (Datta 1998).

Hindu landlords migrated to India, the system began to break down along with the cross-class coalitions among the peasantry. Any remnants of the informal system that remained were finally ended after implementation of the CEP, when the permanency of the concrete polder infrastructure precluded the manual construction of such ad hoc mud embankments.

In 1986, as Bangladesh's shrimp export boom was taking off, investors from Khulna City started to arrive in Polder 23, interested in establishing *ghers* on agricultural lands. In Kolanihat, the largest among these was Wakil Saheb ("Saheb" denotes his wealth, power and high-status), a businessman in Khulna who today still owns a *gher* of approximately 1,200 bighas in size. Wakil's *gher* is managed by Saiful, another outsider from the neighboring district of Shatkhira. Saiful lives in a large house in Paikgachha town, and he manages the guards, also outsiders, who stay in the village. Wakil himself is thus several steps removed from the actual work of shrimp cultivation in Kolanihat. His *gher* situated in a long strip running parallel to the river, Wakil has also installed his own sluice gate to regulate the flow of water in and out of the village (see Figure 38), which operates autonomously from the municipal sluice gate of the Bangladesh Water Development Board. Wakil's sluice gate is used to flood all of the land in the village, primarily during the dry season, when salinity levels in the river are the highest.

Accounts in Kolanihat differ about the amount of force used to compel this transition to shrimp when Wakil arrived, as well as the amount of resistance that was proffered by local residents. Landless people described sentries[84] hired by these outsiders either to force people to give up their land, or to guard the *ghers* once they were established. Accounts of the village's wealthier residents and landholders deviate in varying degrees from these accounts of overt force

[84] The Bengali word used to describe these guards hired from the outside is *mastan*, which translates to "goon," "thug" or "mobster."

used to compel the transition to shrimp. This ambiguity is likely due to their varying degrees of complicity and consent at different points during the transition, which I explore further below.

Figure 38. Wakil's sluice gate

Of particular concerns to all residents, though articulated most strongly by the poorest, is a common sense that these outsiders are guilty of harassing and committing violence against women. As one resident explained, "if it gets too late coming back from work, either cleaning moss or catching crabs from the shrimp *ghers*, you get harassed and insulted. And if a woman is found alone she gets raped, so the roads aren't safe for women." Though I did not hear any specific accounts of overt sexual violence, the concerns speak to a broader tension between local residents and outsiders hired to do work in *ghers*, whose task is to occupy and patrol a landscape that was formerly occupied much more communally. Another resident explained,

> "The situation is such that there is *gher* after *gher* and there is very little road to walk on and even if you do walk, each *gher* owner on each side will accuse you of stealing from their *gher*. Sometimes people cannot get from place to place because they do not allow travel on those roads. They will accuse you of spread [shrimp] virus in the *gher* and causing him losses. I don't want to get caught up in these troubles, so I try to stay away. Some have to travel on those roads, though. Most stay away. Those who do [walk past the *ghers*] have sometimes been physically assaulted."

This sense of occupation is exacerbated by the great extent of land that has been taken over by the *ghers*. Indeed, there is only one narrow path through the village where one can walk that is not adjacent to the *ghers*, narrowly winding between a canal and the thin strip of land on which most of the village's homesteads are located. Thus, the feeling that the *ghers* have taken over the physical geography of the village, encroaching on the space not only for rice farming, but also for walking, gardening, playing, and inhabiting, exacerbates the sense among the village's residents that they are being pushed out by shrimp cultivation.

Now, when smallholders recount this period of rapid and overwhelming transition, it is often inflected with a sense of regret and confusion, as in "what could we have done?" Many smallholders were offered contracts to buy or lease their land, though they report rarely or never having been paid, nor having had a choice in whether they would give their consent. Some reported having their land stolen through different manners of legal maneuver, such as one man from the village next to Kolanihat who explained,

> "We had a lot of land, 18 bigha. But there were complications with that land. A man named [Debjit Prachanda] from the neighboring village drew a fake document and we were forced to give him half of our land. 9 bigha. I had to give some from my share, my older brother had to give some from his share."

When residents describe this kind of legal mechanism of dispossession, it is often somewhat vague, expressed with emotions of simultaneous frustration and shame. The legal benchmark for literacy in Bangladesh is one's ability to sign one's own name. If one signs a legal document that one is not able to read, there is little recourse to remedy the consequences of having been deceived about the document's contents. This particular shrimp industrialist, Debjit, is unlike

Wakil in the sense that he is a neighbor, a member of the immediate community, and someone who villagers are forced to interface with on a regular basis – not only in relation to these questions about land titles and cultivation, but also about any other issues that might arise in the village, such as arbitration in the village *shalish* (local court), organization of local *pujas* (Hindu religious festivals), or any other community concerns. Though this was his natal home, Debjit had been a businessman living outside the village until shrimp cultivation took off in the 1980s. When the shrimp boom began, he moved back to the village and began amassing a large *gher* made up of the former rice fields of neighboring residents. Now Debjit lives in the tallest and newest *pucca* house in his village, a conspicuous three stories high, the cement painted a lurid shade of bright chartreuse. Even as residents voiced their frustration about losing their land, they also expressed caution about wanting to avoid outright altercation with this very wealthy and powerful neighbor.

While several residents describe this kind of overt land grabbing, many also report that they signed leases to allow the use of their lands for shrimp, though they also explain that they didn't want to sign the lease, or that they felt that the terms of the lease were subsequently violated. Gorongo, a local schoolteacher and self-proclaimed cricket star, owner of a 10 bigha *gher,* chronicled this history for me one afternoon over tea:

> "Lots of guys came from the outside and took leases then. Our environment was *so* beautiful. Everything was green. We loved it! But then they came and took all the land. They gave 500-700 taka per bigha. It wasn't our choice. They did so well. They built big, beautiful buildings in their own areas. But we didn't develop here. We didn't get any benefit."

As Gorongo articulates it, the question of "choice" is fraught with ambiguity for smallholders throughout the region. They express regret over their initial assent, but anger over their inability to recover their land. Another resident of a neighboring village recounted his struggles over the terms of his lease,

> "These people are the ones who allowed the salt water to be brought in and they are now suffering. They are not able to push out the outsiders or get out [of the shrimp business]

> themselves. It is the local people who made mistakes. They rented out their five bighas of land. Now I am in trouble because where I signed the deed for three years, he rewrote it to be twenty years. Mr. Wajed Ali[85] came and made a lease for three years... Now when the three years elapsed, we did not want to renew it, but then he showed that the deed said twenty years. At that time, he was very powerful, you could say he was the government… We do not understand too much about the law, but somehow he showed that we had signed a twenty-year lease, whereas when we signed the document we knew it was for three years… He told us nice things and took our signatures on official paper and then wrote twenty years on the lease. What will you do? If you go to attack him, the police will come to take us away. They'll say 'didn't you pay attention when you signed?' What can we say now? If we complain to the administration, they'll say 'you signed there for twenty years. If you hadn't signed, it wouldn't have been twenty years.' They harassed us into this situation."

As this smallholder describes it, he feels some sense of responsibility for having allowed the initial encroachment of shrimp into his village, but also regret over the feeling that he had been tricked into a permanent loss. Importantly, he also articulates anger of complicity between the local authorities and outsiders, and a frustration that this elite collusion that has entrenched the shrimp industry in their area.

Beyond these specific disputes over land tenure, conflicts over water management became the primary arena through which contestations between rice and shrimp played out. Hydrological units within the polders must be managed collectively, as water intake and drainage are shared across broad areas, usually the size of a full village or larger.[86] This means that control over the water regime results in control over the production regime of the same area. With drainage access to the river obstructed for interior smallholders like Gorongo, the rest of the land beyond Wakil's *gher* remains waterlogged year-round. Thus, Wakil has the power not only to continue farming shrimp on the 400 acres over which he has maintained control, but also to make production

[85] Wajed Ali is a well-known shrimp businessman and notorious land grabber in Khulna. I use his actual name here because due to his public notoriety. He will appear again in the following chapter.
[86] Hydrological units are spatially, not politically delimited, with boundaries set by large embankments or major roads, and thus often pass through the borders of a village or other political unit.

decisions for the entire village. If Wakil wants to keep cultivating shrimp, then the village cannot return to rice farming, nor the social life and agrarian political economy associated with it.

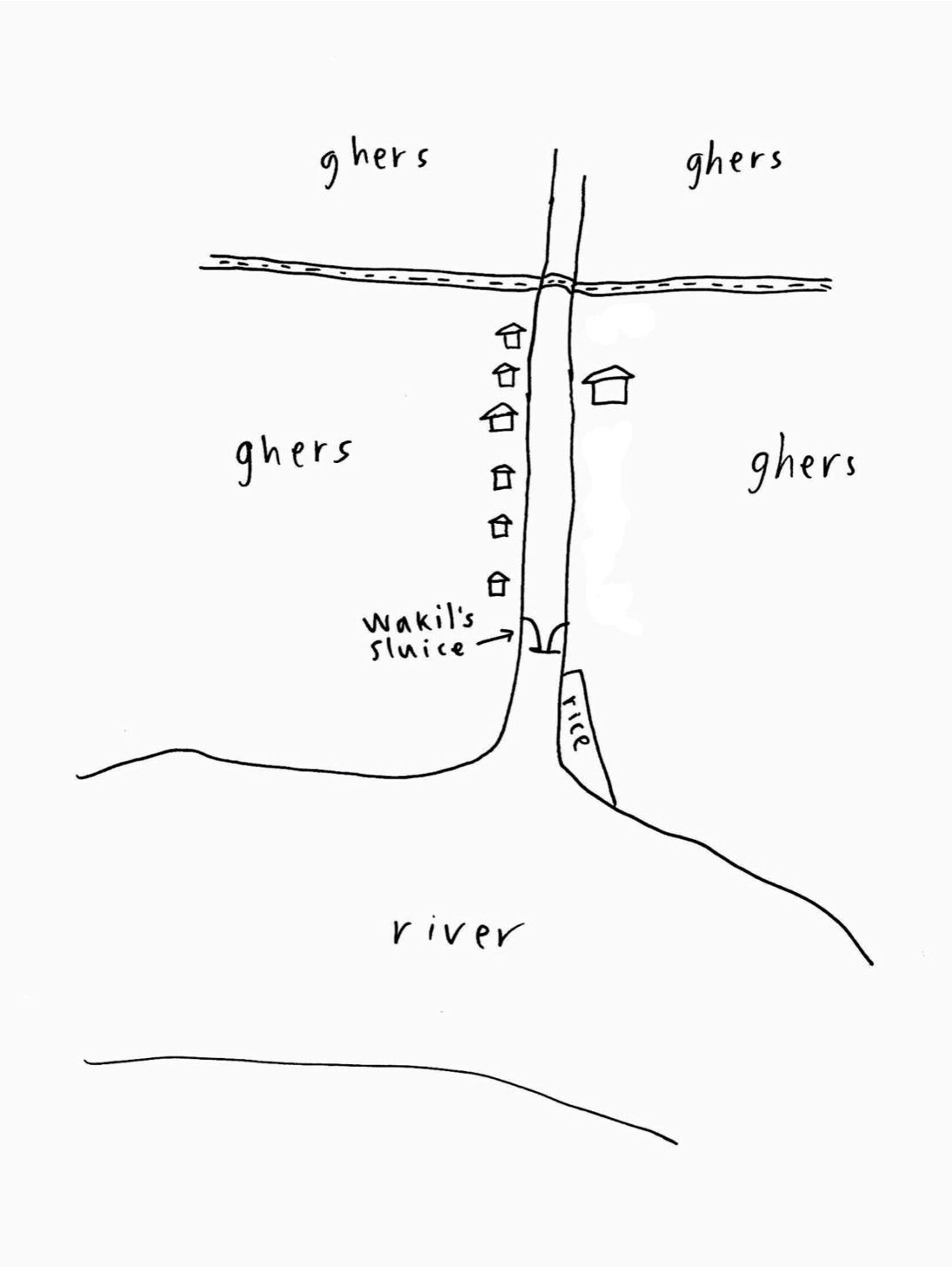

Figure 39. Sketch of Kolanihat. Drawing by Anders Bjornberg

This control over the hydrological system can be secured through political means, or by surreptitiously breaching the embankments dividing plots of land. In many communities, this is also achieved by boring holes in the embankments to install pipes used for water intake as an alternative to a full sluice gate. When farmers in Kolanihat describe their resistance to land grabbing for shrimp aquaculture, it is primarily these water management conflicts that they highlight. As one farmer whose land had been taken explained,

> "The salt water destroyed the roads and nobody fixed it. Slowly famine started to show. Business slowly started to break down. I would go to people and say 'I am not even able to eat rice; how will I pay you back?' I was born in the area, so I know that if I am unable to eat, how can I force someone else to pay me?... There has been fighting, cases have been filed [against] the businessmen who do *ghers*. There have been clashes with them. These people live in the city, some live in Khulna, Shatkhira. The rich people who control the administration have been torturing us. We seal the WAPDA [embankment][87] and then they go at night with police and they break it. When we go out in the morning they send goons hired from the city to attack us. They torture us. If we go to the police station, they make us file a General Diary [police report] and they say 'we will look into it.' They say they will look into it, but that very night the water is released into the *gher* again."

This testimony highlights both the physical force employed in compelling the transition to a saline landscape for shrimp cultivation, as well as the complicity of local government officials in exercising that force. Although Wakil operates his sluice gate independently, residents explain that this is done with the implicit support of local officials, who not only do not restrict the intake of the water, but also do not facilitate its drainage. Another resident explained,

> "If you want to bring in salt water into an area, you need permission from the local government to close the gate, to put in a channel. And if the rich people don't decide on this, then people who don't have much money or have no money can't do anything about it. If the rich people decide to do it, they need to go get permission from Paikgachha *thana* (policy station) to open the gates so they can do shrimp cultivation. It takes 50,000 taka. People like you and me can't go and get permission from the Paikgachha *thana,* we won't even know anyone there or know what to say."

[87] As discussed in Chapter 1, the embankments of the CEP were constructed by the East Pakistan Water and Power Development Authority (WAPDA). The Bengali word for these major external embankments ("badh") is the same as the word used for small earthen embankments between fields. As a result, in Khulna the embankments surrounding the polders are often referred to as "WAPDA badh," or just "WAPDA" for short.

This unequal control over water infrastructure combines with the necessity of these decisions dominating the entire hydrological unit. Even where an embankment is not intentionally breached between fields, a shrimp *gher* adjacent to a rice field causes seepage of water and salt deposits, destroying the rice crop itself and causing increased levels of soil salinity. This prevents cultivation decisions from being made independently. Thus, control over the water management regime becomes de facto control over production decisions in the entire area.

These conditions of conflicting water management paradigms have been foundational to the expansion of shrimp aquaculture throughout Khulna. In 1993, Adnan wrote that early analyses by development programs of the economic benefits of shrimp cultivation in Khulna were based on assumptions about effective and equitable water management allowing for the cultivation of both rice and shrimp (Adnan 1993). However, he explained, such assumptions were flawed due to these inequitable water management practices, "efficient management of water flows is only possible for those who own or operate the appropriate water control mechanisms – typically the large shrimp-growing business interests, rather than the poor or middle peasants whose lands have been inundated with saline water against their will, leading to involuntary shrimp culture" (Adnan 1993). This involuntary shrimp culture is the circumstance in which smallholders in Kolanihat and elsewhere in Khulna now find themselves. It is the condition, in varying degrees, articulated to me by every smallholder *gher* operator I talked to in Kolanihat.

Landscape Changes

These transformations in the water and production regimes have been accompanied by similarly dramatic transformations in the local ecology. Among these changes, the death of most of the village's great diversity of trees is most frequently cited as evidence of the transformed landscape. Villagers lament in particular the loss of the fruit trees, citing the former presence of

coconut, date palm, tamarind, banana, guava, mango, jackfruit, pomegranate, wood apple, jujube (*kul*), and plum (*jaam*) trees. Since the time that shrimp cultivation began, these trees have all died due to the soil salinity. The few trees that remain now are *keora* trees, a mangrove species that can survive in moderate to high soil salinity, considered more tolerant of highly degraded landscapes, though they don't contribute to subsistence in the form of fruits or fuel wood.

The loss of these fruits has contributed to an overall decline in subsistence production capacity in the village. The loss of farmers' ability to grow and store rice for family consumption has had the most serious impact on subsistence. However, the ecological collapse that precipitated the death of the trees has had a range of other impacts that have shaped the ability of villagers to survive in this landscape. As the *ghers* expanded, moving closer and closer to residential plots, the salinity seeped into the soil surrounding their homesteads, affecting the plots where they used to cultivate gardens. These gardens formerly supplied a great abundance of vegetables that fed the families of the landless and land rich alike throughout the year. Many reported that not only were they able to grow enough to feed their families, but there was such an abundance that they would openly share with their neighbors these yields from their gardens. "It was not possible to eat all of them," one man said, "we didn't sell them, whenever someone in the area needed a particular vegetable, we would give it to them… Now it has become salt water. I myself have to buy all my vegetables, so how could we give to others?" Villagers mentioned cultivating okra, eggplants, pumpkin, string beans, radishes, potatoes, taro, and several different varieties of greens and gourds, none of which will grow now.

The salinity seeping into the soil has also gotten into the drinking water supply. One staff member in Dhaka managing a WorldFish project supporting shrimp cultivation in Paikgachha once said to me "some people said 'our drinking water is salty because of shrimp,' but I don't know how you can really prove that." Indeed, as with many other aspects of ecological change in

Khulna, "proof" of what is driving up the salinity in drinking water in Paikgachha is elusive. People in Kolanihat trace the salination of their drinking water to the transition to shrimp cultivation. Previously, the primary source of fresh water in the village were ponds that were recharged with fresh water annually during the monsoon. The water from these ponds was used for a variety of household purposes – bathing, washing clothes and dishes, and drinking and cooking (they would boil the the water before drinking it). These ponds used to be situated near people's homesteads, and would usually be accessed communally by neighbors from the surrounding area. Now that the domestic space has dwindled, contracting as the *ghers* have expanded, there are no more ponds in the village. There are also some tube wells from which people used to retrieve drinking water, but people say the quality is not good, as it has become saline, and is otherwise contaminated, making it unsuitable for drinking.[88] They also collect rainwater for household use, and some have devised relatively elaborate systems of running ropes from troughs on the rooves of their homes into large earthen drums on the ground to collect the water. However, without larger receptacles for the water like the ponds, these home-based tanks usually don't last more than a couple months.

As a result, villagers are now forced to purchase all of their drinking water, which women and children carry in from outside. Some travel to a neighboring village about 10 miles away where there is a tube well that supplies fresh water, and some go to a pond in Paikgachha town. They pay 10 taka to fill a 10-liter aluminum vessel. Most members of the community travel by foot to carry water back, while those who can afford it pay an additional 10 taka to travel by

[88] Some also report that the water has iron in it, which could indicate a more serious contamination. The presence of iron is visible as it leaves red deposits on the ground when water evaporates. Iron is also frequently co-occurring with arsenic, a major problem with tubewells in Bangladesh. As arsenic is invisible, people are more likely to detect a contamination with iron than they are with arsenic. Alexander van Geen, a geochemist at Columbia who studies arsenic contamination in groundwater in Bangladesh, told me that due to this visual evidence of iron deposits, people frequently identify problems related to arsenic contamination (such as reduced rice yields) to iron contamination.

nosimon,[89] the most common means of motorized transport locally. Several people noted that their families generally needed more than one of these 10 liter vessels to meet their domestic needs in a single day.

In addition to this water, villagers are also now forced to purchase cooking fuel from Paikgachha. Before shrimp, there were large areas in the village where cows could graze on grass. After shrimp cultivation began, these areas ceased to exist, as the communal spaces gave way to *ghers* and the grass died on the land that remained. In the absence of grass, the only way to raise cattle is to purchase hay from Paikgachha. In addition to providing milk, these cattle also supplied residents with the majority of their cooking fuel. The traditional fuel called *ghute* is made by gathering cow manure and patting it into round cakes or molding it around long sticks (usually the stalks of jute after their fibers have been extracted), which are then dried in the sun. Now that there are few cattle left in the village, residents purchase fuel from Paikgachha town for 160 taka/maund[90] (plus 10 taka for transport by *nosimon*).

The enclosure of these commons also extended to the large canal running through the village that used to serve as the primary outlet for drainage and inlet for fresh irrigation water.[91] In order to retain the water in for shrimp cultivation, the *gher* operators have blocked the canal and turned into into another space for shrimp cultivation. As one woman explained,

> "All the water bodies belong to someone [now], they won't let you catch fish from there. Before, all the rivers, wetlands, and lowlands were open for everyone to go catch fish. The rich, the poor could all catch fish and eat them. No one would stop them… The rich people have paid money and taken land from the poor… All around is just water and water, we don't have the beautiful, communal, and wholesome environment that we had before."

[89] A *nosimon* is a three-wheeled vehicle built by local mechanics using small, diesel-powered tractor engines. They can accommodate up to 10 people on the wooden flat bed in the back. They ply the major road through Paikgachha, making stops to pick up or drop off passengers at any point on the fixed route.
[90] One maund is equal to approximately 40kg.
[91] See also Paprocki and Cons (2014) on the collapse of common-access resources in Polder 23.

As this resident suggests, when the canals flowed directly from the river, they were full of a great diversity of wild fish that residents could capture for their own consumption (residents mentioned several native fresh water species, including *rui, shoul, baila*, *boaal, taki,* tilapia, carp, catfish, climbing perch, freshwater prawn, and crabs). Now that the canals have been closed off, access to fish has declined, and many report that they are unable to afford to purchase them to feed their families. Some allow tilapia fish to grown in their *ghers* along with shrimp, which they call "khaoar mach," or "eating fish," which they can't sell, so there is sometimes access to these for local consumption. Several expressed frustration with this dwindling diversity, while one woman said "how many times can you eat the same tilapia fish?... I am fed up with having this tilapia fish, I don't even like it anymore." Several other residents also expressed dissatisfaction with an ironic state of affairs in which the expanded production of fish for export in their area resulted in a scarcity of fish for their own consumption (the Bengali word for fish, *mach*, is also used to refer to saltwater shrimp, which are called *bagda mach*). Another woman recounted, "we can't always get fish. It's like being thirsty when you're in the middle of the ocean surrounded by water. We are surrounded by fish here, but we're always craving it." These active dispossessions combine into an assault on access to almost every means of subsistence previously available to villagers in this community.

Tenure Transitions

For about 10 years, this land tenure situation in Kolanihat went on in the same condition as when shrimp cultivation started, with Wakil massive *gher* that covering most of the village. As time went on, the smallholders whose land had been taken over received fewer payments, or rents ceased altogether, and those who had initially been open to the arrangement became more and more disillusioned with it. Then, in the mid 1990s, these land tenure conditions started to shift.

There is a very large but dilapidated colonial-era zamindar bari[92] on a large and solitary plot of land on the opposite side of the canal from the rest of the village's residential area. Today this zamindar bari is inhabited by Radhika, an elderly woman whose father-in-law lived there before Partition, along with four sons (who also have other residences outside the village), daughters in law, and several grandchildren. One of Radhika's sons is a doctor, and another is a member of the Union Parishad committee, making him a very powerful member of the community. The family sleeps on wooden cots on the ground floor of this three-story mansion, and their plastic furniture and other modest and sparse fixtures suggest some deterioration from what was once presumably a lifestyle of great affluence and comfort.[93]

Radhika told me that when Wakil first came to Kolanihat, they were enticed by the promise of a lucrative lease, and they agreed to rent out their large plot of 200 bighas to Wakil to incorporate into his *gher*. Like other large landlords in the village, they had previously let out most of this land to local sharecroppers. This assent of the wealthy local landholders gave Wakil a great deal of legitimacy and power in the village, and made it more difficult for those who owned just one or two bighas to resist the loss of control over their own land. After 10 years, however, Radhika's family was only receiving 1,500 taka/bigha from Wakil, and they had become disillusioned by the deteriorating economic conditions and their limited share in the profits. Radhika told me she thought the rent should have been 10,000 taka/bigha (though most smallholders told me that the accepted rate for most people in the village at the beginning was 500 taka/bigha, and now it is between 4-7,000 taka/bigha). When Wakil refused to return their 200

[92] Zamindar baris were the residential palaces and centers of business administration of the large colonial-era estates of zamindars. Many were abandoned after the abolition of the zamindari system in Bengal after independence. Today some of the larger estates have been turned into museums, while others are inhabited by squatters or the descendants of their former proprietors.

[93] Shrimp cultivation is certainly not the only cause of the change in this family's fortunes. Like many large Hindu landowners in what is now Bangladesh, Radhika told me that her family left for India around the time of Partition. They returned after Bangladesh's war of Independence in 1971, but they are unlikely to have fully recovered their former wealth from the period prior to their migration.

bighas to them, Radhika's family pressed charges against him with the local police. Their family's wealth and political position in the community gave them significant influence with the local authorities, and their case was successful.

Once they regained control of the land, Wakil's *gher* still stood between them and the river, making access to water and drainage difficult. Radhika told me they didn't want to continue running the *gher*, but they didn't want to give up their land either, and under the circumstances, they didn't have a choice. Also, having observed Wakil's success, they thought they might get some benefit from their own shrimp *gher*, and so they began to cultivate shrimp independently. When I asked Radhika how they like the shrimp *gher* business, she looked at me impassively and said, shrugging, that they don't really care, they hire other people to do the work. On another occasion, she told me that they were disappointed with the profits they earned from shrimp, so they don't really like it. This ambiguous indifference may or may not be genuine; several smallholders, whose own narratives I explore in further detail below, reported to me that Radhika's family support the continued production of shrimp in the village and that they were among the greatest obstacles to a collective mobilization toward transitioning back. In this sense, despite their earlier conflicts with Wakil, Radhika's family may now be allied with him in ensuring the perpetuation of shrimp production in the village.

In addition to their shrimp *gher*, however, Radhika's family has three bighas of land surrounding their home where they have continued to successfully grow a crop of *aman* rice. They have their own private tube well that they can use to supplement rain water for irrigating a garden (and from which they also retrieve drinking and cooking water for their own household use). The land is elevated near their home, being at a higher point than the surrounding *ghers,* so salinity seepage poses less of a problem, and gravity facilitates drainage. To cultivate these three bighas of rice, they usually employ about 7 people per season. For their 200 acre *gher*, by contrast, Radhika

said 2 of her sons look after managing its operations (in addition to the work they do in Paikgachha), and once or twice a month they hire a group of 5-7 women to do *sheola kaj,* collecting scum off the surface of the water, which I explore in more detail below. Before the shrimp boom, they said they cultivated both *aman* rice and sesame, a winter crop requiring very little water, and relatively tolerant of salinity, making it well-suited to cultivation in the saline-prone parts of the coastal region. The people they hire for this work of rice cultivation are local laborers, this being one of the only agricultural opportunities left in the village. An elderly couple doing mid-season weeding work in the field surrounding the zamindar bari told me that they were formerly sharecroppers, but once the land they used to farm was leased out to Wakil, this labor in the last remaining rice fields was the only livelihood left for them in the village.

Though Radhika says their yields are slowly declining every year, they still get about 10-12 maund/bigha. Radhika and her family keep all the rice grown on their land for their own consumption, and despite the declining yields, they say it feeds them throughout the year. Yet, besides the income from the *gher*, it is not their only source of livelihood. Radhika's sons do business in Paikgachha, and they use this income to supplement their consumption. They thus inhabit the same ambiguous occupational category as Arjav's sons; although they earn some income from shrimp, it is their off-farm earnings that sustain their family.

Once Radhika's family had regained control over their own land, a precedent was set that created an opening for the smallholders who remained in the village. One small *gher* operator described this to me as *gono dokhol*, meaning collectively taking possession or control. Yet, the recovery has been uneven, and those whose adjacent plots holdings are smaller, or are surrounded by Wakil's still-sizable *gher*, have been unable to reclaim their land. As Gorongo, the aforementioned cricket star explained to me,

> "So, we saw that they did so well, we wanted to try ourselves. We had a struggle with them, we went to war. And through the struggle, we got the land back... Some landless got

> work in shrimp trading, but very few. Everyone else had to leave. It's very important that you tell people, like at big seminars, that we want our land back. You have to take this story back with you and tell people. Many people here who just had small plots of land have never been able to get them back."

Gorongo's statement here is indicative of the descriptions of this period of land repossession among smallholders. They clearly articulate the hardships they experienced in losing access to their land, then express the struggle to have it returned to them, yet they also appear hesitant to characterize this recovery of their land with any sense of triumphalism. As they expand on their current conditions, it becomes apparent that this hesitance is primarily due to their sense that they still don't have autonomous control over their land, and they have been largely unsuccessful in managing their own *ghers*. Even as Wakil technically returned their land to them, with drainage blocked and all of the land in the village perpetually covered in salt water, their choices are severely constrained in how they can use it. Instead of recounting their success in regaining control of their land, they recount the struggles they experience now in trying to earn a livelihood from it.

Today Gorongo operates a *gher* 10 bighas in size. In relation to average landholdings in rural Bangladesh, this is a very large amount of land, while it is among the smallest shrimp *ghers*. The results have been mixed. Sometimes the profits can be good, but the threat of diseases that plague the shrimp industry here (in particular, White Spot Syndrome, which villagers refer to simply as "virus"), poses a constant threat of killing all the shrimp in a *gher*, spreading quickly between plots. Because shrimp requires a significant upfront capital expenditure, the loss of a *gher* full of shrimp to the virus can be catastrophic. The post-larvae must be purchased either from dealers who get them from a hatchery or from people who collect them wild in the river. They also purchase other inputs such as feed and fertilizer. Each of these items comes in variable qualities and costs, although aquaculture development agencies say that using inferior quality post-larvae and inputs results in both lower yields and greater susceptibility to shrimp viruses. The

international shrimp market also fluctuates significantly, which has a dramatic effect on these smallholders. They say that the price they are paid for shrimp should be 700 taka/kg, and that they need about 500 taka/kg to break even on their investment. In 2014, they were receiving 350 taka/kg, despite a national supply shortage that should have driven prices up (Moni 2014). These declining rates are likely due both to the power of the many middlemen within the country's lengthy shrimp supply chain, as well as a sharp and unexpected plummet in exports to the United States, where importers were prioritizing cheaper and lower-quality imports from China, Vietnam, and Thailand (Haque 2014).[94]

In order to afford these significant upfront investments, smallholders like Gorongo take microcredit loans at the beginning of the season. When their *gher* is struck with the virus and all their shrimp die, or they don't earn enough to break even, they take more loans to repay the previous ones. I regularly heard that there were many people who had lost their land in this way – after years of trying to get their land back, they finally regained control, only to lose it altogether when they couldn't afford to manage the *gher* and all of the costs it entailed. These people, who have lost their land through debts to microcredit agencies or wealthier neighbors, have all left the village.[95] Staff at a local BRAC microcredit branch office told me that most of the loans they give in Paikgachha are for investments in *ghers*, and that they encourage borrowers to take loans for shrimp cultivation because it is good investment in the area. One collection agent said to me

[94] The variety of saltwater shrimp produced commercially in Bangladesh is giant tiger shrimp, or *Penaeus monodon*, known locally as *bagda*. This variety grows larger than the whiteleg shrimp, or *Litopenaeus vannamei*, that is the most commonly cultivated variety of tropical shrimp globally. *Vannamei* grows well in intensive conditions, which entail even more significant investments, allowing for greater yields per hectare, more common in these other large shrimp-producing countries. *Monodon* grows "extensively," meaning that it takes up more space, with lower yields, but allowing for shrimp that are larger in size. This means they are considered higher quality and higher cost; as a result, economic downturns often cause international buyers to shift to the lower cost variety. The large *Monodon* shrimp, one WorldFish employee told me, using an Australian colloquialism, "is the kind you want to put on the barbie."

[95] Throughout rural Bangladesh, it is common for people to be forced to migrate away from their homes when they are unable to repay microcredit loans. See Paprocki (2016) for more on this process of dispossession.

"when you look around this area, you can see that it is more developed." When I asked for clarification of what made it more developed, he looked at me as if it was obvious – "because of all the *ghers*." By continuing to encourage the use of microcredit loans for investments in shrimp aquaculture, microcredit agencies participate in the promotion of this particular vision of development for rural communities in Khulna.

In this context, despite intermittent success with his own *gher* when prices are high and the virus is kept at bay, Gorongo explained to me, that he likes farming rice, and would love to return to it, but with big *ghers* like Wakil's, the choice is out of his hands. "If everyone was doing rice, then we would be happy," he said, "we all want to farm rice, but we can't… If everyone moved back to rice, we would be free of saltwater. But without that, we can't do it." This antipathy toward shrimp cultivation expressed by Gorongo and Arjav is the prevailing sentiment among smallholders in Kolanihat. In casual conversations with residents, sitting together in small courtyards and tea stalls, questions about shrimp provoke deep groans, eye rolls, people throwing up their hands in resignation, gesturing to the surrounding barren landscapes. They explain that they sometimes earn well when the price of shrimp on the international market is high, but these markets are erratic, and therefore livelihoods dependent on them are unreliable. The word most often invoked to describe their conditions under shrimp cultivation is *obhab*, meaning scarcity or deficiency. One woman whose husband manages a 10 bigha *gher,* complaining about Wakil blocking the river, explained to me "we have scarcity because we don't do rice."

Besides Radhika's family, a few others have occasionally attempted to farm rice in the village under the current water management regime. One man who now lives in Paikgachha town was able to lease a 6 bigha plot of land from some wealthier landholders in Kolanihat around the year 2000; the land is located near the head of the canal inlet coming off the river, but outside of the contained area that is flooded by Wakil's sluice (see Figure 39). Prior to taking this lease, he

had been working as a shrimp trader, but he said he really wanted to go back to rice farming. Although the land had previously been used as a *gher*, he decided to try to flush the salt and use it to cultivate an *aman* rice crop, which he has been doing over the past several years. He told me that every year he has been operating at a loss with the rice, with low yields and significant costs for land rent, seeds, and insecticides. The yields were increasing, however, and he said he believed that eventually enough salt would be leached that he could turn this rice plot into a successful operation. It is evident in seeing the crop that recovery of the soil is still ongoing, but that cultivation will certainly not be impossible (see a picture of the crop mid-season in Figure 40).

Figure 40. Rice plot near the river recently converted back from shrimp gher

For now, he and his family are just eating the rice, but he thinks that within a few years he will have a surplus to start selling. His growing success with this rice cultivation demonstrates the continued potential of rice cultivation in this area, despite claims that these shrimp-producing landscapes are no longer viable for agriculture.

I also observed a few other people inside the embankment in Kolanihat and the villages around it who were attempting to farm rice during the *aman* season. I Kolanihat they were concentrated on the far side of the village from Wakil's *gher*, and I could see that they had fashioned small drainage ditches to try to siphon off the saltwater. While no one had done this for any significant period of time, some told me that they had been doing it a few years, despite meager yields. They said that their farming was hampered by insufficient drainage and residual salt deposits in the soil, but that the monsoon brought enough fresh water to flood the rice paddies. They estimated yields between eight and 12 maund/bigha, which is about one half to one third of standard rice yields (one person cited yields as low as two to three maund/bigha). The best they could hope for would be to break even, a couple of them told me. Given these low yields and bleak prospects, I asked them why they continued to try to cultivate rice. They said that they had *ghers* on their land in the dry season, but they weren't having a lot of success with either shrimp or rice, so they might as well try farming rice, since at least their families could eat that. It seemed like a better gamble, given that they could lose everything if their shrimp were struck with a virus. One man who said that he expected enough rice to feed his family for five months told me that rice was better for the environment, so they hope to keep expanding the area under rice cultivation in the village. They also expressed some hope that if they could start farming rice, even if they weren't having much success, by leaching some of the salinity buildup in the soil, it may facilitate a return to year-round agriculture if the whole village ever was ever able to do so. Despite the great costs entailed in producing rice under current conditions, their commitment to

continuing to attempt it reflects an optimistic vision of the future quite at odds with that of the adaptation regime. In anticipating the possibility of an agrarian future, they refuse the ruination of the adaptation regime's dystopic imaginaries. In Chapter 6, I examine village-level transitions in neighboring polders grounded in similarly optimistic imaginaries of the future.

Depeasantization[96]

These attempts to continue farming rice also speak to a desire to hold onto an agrarian lifestyle that is in the process of being lost. People like Radhika's sons, who earn most of their money through non-farm livelihoods, no longer identify as farmers. Even when they are speaking of their work with in the village with the *gher*, they say *chingri byabsha kori*, meaning "we do shrimp business," as opposed to *chingri chash kori*, meaning "we farm shrimp." Some smallholders say "I am a farmer" but "I run a *gher*," as opposed to "I farm shrimp" (though they are technically interchangeable). These shifting identities speak to broader shifts in the agrarian political economy of the village. Villagers in Kolanihat repeatedly spoke of the demise of the farmers in their community. As I quoted one former farmer in Chapter 3, "chingri krishoker dhongsho koreche" – "shrimp has destroyed all of the farmers." This is meant both literally and figuratively. Indeed, in the literal sense, many people have been forced to leave the village, particularly landless people, for whom labor opportunities in the village have been eliminated. Remaining residents describe this great exodus that has taken place in the aftermath of the shrimp boom; as one smallholder explained to me, "those who didn't have land, they have all left." With opportunities for work disappearing, and their ecology no longer able to support the kind of subsistence production that formerly sustained them, life for these people in these shrimp producing landscapes becomes

[96] See also Paprocki and Cons (2014) on the relationship between shrimp aquaculture and dispossession and depeasantization.

increasingly untenable. A professor at a university in Dhaka with several decades of experience studying Khulna's coastal ecologies attributed this specifically to the transition from rice to shrimp, explaining that where saline shrimp is produced, "the area becomes almost uninhabitable," and "people have nowhere to go," indicating both the ecological and socio-economic impediments to maintaining human settlements under such inhospitable conditions.

In addition to these literal reference to the departure of so many residents, the demise of farming also refers figuratively to the people who have stayed, but who can no longer be identified as farmers in the traditional sense. For some it reflects their profound struggles to survive in this landscape. One widow in Kolanihat who farmed rice on a half-bigha plot before shrimp, that has now been completely consumed by Wakil's *gher*, lamented the loss of opportunities for survival in the village, the lack of drinking water, and the failure of her garden. "We don't have any money; we can't pay for medicine or meet any of our needs. So, we are dying," she said to me. For others, like Arjav, it means that their survival has become so dependent on off-farm incomes that their identity as "farmers" has become compromised. Those who have stayed and today operate small shrimp *ghers* do so primarily through the support of off-farm employment by at least one if not multiple family members. These non-agrarian incomes increasingly become the backbone, rather than a supplement to, this rural economy. This shift is the reason that they say their village will have no future unless they can find a way to return to agriculture.

Job Loss

Shrimp cultivation entails a radical reduction in labor demand relative to rice farming. While the shrimp boom has produced limited labor opportunities in Kolanihat (described below), the amount of rural labor that has been created is dwarfed by the amount which has been eliminated. As one woman explained,

> "Previously, if one person had one bigha of land, 20 people would be employed for working on that land. They would be busy cutting the earth, harvesting rice, plucking grains and various other activities. Those who did not have any land would survive just by working in the fields. Nobody was unemployed. After the ghers happened almost everyone is unemployed. Nobody can avail any work. A person with a gher, manages it on their own. Only one person is needed to manage a gher. Previously one person would employ a minimum of 5 people but now more and more people have become unemployed. Now whoever has 1 bigha of land does not employ anyone else. They do the work on their own."

The result of this transformation is rampant unemployment among landless people who formerly depended on agricultural labor to survive. Joining their ranks are the landless who formerly depended on sharecropping, regarded as a more secure livelihood than that of day labor. Larger landholders like Arjav, who earlier arranged with landless neighbors to grow rice as sharecroppers on his surplus land, no longer required such arrangements, and the availability of land quickly dwindled. While rice is often grown on plots as small as a single bigha (one third of an acre), shrimp *ghers* operate at much higher economies of scale, as most *gher* operators describe plots of even a few acres as being untenably small. Most of these people, who have become redundant to the new rural economy, have by now left Kolanihat.

It is common for development agencies promoting shrimp aquaculture to claim among its economic benefits the creation of new jobs. However, most jobs created by the shrimp industry are in cities like Khulna, where workers (mostly women) work in processing factories peeling and "de-heading" shrimp for freezing and packaging before they are exported. The levels of labor demand within villages that have transitioned to rice are also a source of great uncertainty and disagreement. I frequently heard from Nijera Kori activists and laborers in Kolanihat and elsewhere in Khulna that shrimp cultivation requires about 1% of the amount of labor that rice farming requires. A member of the ESPA Deltas team (see Chapter 4) told me that their surveys suggested estimates of somewhere closer to 10%.

Rice	Shrimp
182.73 PD/ha[97] (*single cropping*)	80 PD/ha[98]
240 PD/ha[99] (*double cropping*)	80.4 PD/ha[100]
308 PD/ha[101] (*double cropping*)	106 PD/ha[102]

Figure 41. Calculations from different studies of labor requirements for rice and shrimp cultivation systems. Calcuations in person-days per hectare per year.

The table in Figure 41 lists a series of estimates of labor demand for shrimp cultivation and rice farming from several different studies. The figures demonstrate a great deal of variance in estimates of the amount of labor required for both shrimp and rice production, although all figures denote significant discrepancies between rice and shrimp. Nevertheless, these figures also reflect a greater ratio of labor requirements for shrimp than the estimates I heard from landless community members in Khulna.

Bighas owned	Land in hectares	People hired	Approximate person-days per ha hired (PD/ha)	Notes
200	26.99	5-8 for 1 or 2 months	5.6 – 17.8 PD/ha	(calculated at wages paid every day for 1-2 months, which is unlikely)
25	3.37	(none)	0	Sons do work in addition to their off-farm labor
170	22.94	2-3 for 5-6 months	13.1 – 23.5 PD/ha	
18	2.43	3 for 1-2 months	37 – 74.1 PD/ha	
7	.94	(none)	0	Sons do work in addition to their off-farm labor
80	10.8	1 man, year-round	33.8 PD/ha	

Figure 42. Kolanihat gher *owners' estimates of the amount of labor they hire annually for shrimp cultivation*

[97] This figure is based on data collected in a primarily single-cropped area in Paikgachha in 1987-88 by Datta (1998, 43).
[98] (Joffre et al. 2010, 57).
[99] (Dey et al. 2012, 15).
[100] (Alauddin and Hamid 1999, 291).
[101] (Karim et al. 2006, 36).
[102] (Nuruzzaman 2006, 448).

Estimates from *gher* owners in Kolanihat also offer a different picture of these labor requirements, and while they do not suggest a clear pattern, they do give us a better sense of how the lower estimates above could have been reached. The figures from Kolanihat listed in Figure 42 are based on conversations I had with six different *gher* owners or their agents based in the village. They are very rough because the shrimp cultivation season is not predictable. Two of the owners said they didn't hire anyone because their sons did all the work (although it is possible that they would occasionally hire groups of women for work in the *gher* once or twice a month). The estimates involving multiple laborers are possibly high, because there is rarely paid work available every day for large teams during the period when shrimp is being cultivated, so it is also likely in this case that many of these laborers were hired for only part time work during these periods. All but the one man hired to manage the 80 bigha *gher* said that if the shrimp were attacked with the virus, there would be no need for them to hire any labor, and the discrepancies in time periods reflect this uncertainty about the survival of the shrimp. All of these land plots are large enough that before shrimp they would have hired labor to support with rice planting and harvest, and in the bigger plots they almost certainly would have given the land to sharecroppers to farm for a portion of the yield (which several of them confirmed to me).

This somewhat inscrutable collection of figures gives a sense of how unpredictable the availability of labor opportunities is in shrimp production systems; it also conveys that we should treat all figures relating to the labor in these systems with some caution. While some of the figures confirm the very low estimates provided by activists and landless people, the more important point to be taken away from them is how uncertain the work is for residents who would rely on it. As Edelman argues in relation to large-scale land grabs, focusing on the quantitative dimensions of this transformation, particularly in relation to problematic quantitative data (from NGOs and social movements, as well as what I have provided here), may divert focus from the very real

transformations taking place in social relations and livelihood patterns (Edelman 2013). One researcher studying shrimp and rural livelihoods in Paikgachha for an NGO in Dhaka told me that their survey research revealed that shrimp cultivation had caused residents' incomes to grow, thus causing an increase in food security. However, in focus groups, they found that people consistently reported that they were food insecure, and that their food security had declined significantly from the period when they produced rice. The organization found the claims made in these focus groups to be dubious, given their own quantitative data indicating the contrary. The discrepancy between this NGO's data and the local perceptions may indicate a straightforward preference among residents for more stable consumption. Indeed, if the incomes of some increase considerably at certain parts of the year, yet they are not stable or predictable, and their subsistence options in the village have declined throughout the year, then they may experience the transformation as an increase in periods of food insecurity, despite an overall increase in cash flow. Yet, my research in Kolanihat suggests that the foundation of these perceptions may involve a much greater scope of values and epistemological politics. Edelman writes that "every dataset has an implicit epistemology behind it" (Edelman 2013, 494). This is certainly true of the figures in both tables above, as well as my ethnographic dataset from Khulna. The testimonies presented in this chapter demonstrate that, for local residents, assessment of sufficient, meaningful, and properly remunerated labor opportunities must involve much more than a quantitative calculation of the number of jobs created or lost.

Shrimp Labor

A closer look at the type of labor available in shrimp *ghers,* however limited, facilitates an understanding of how these assessments are made. The most common work in the shrimp *ghers* is known as "sheola kaj," literally "algae work," in which one wades through the waist-high waters of

the *ghers* using their hands to skim the algal blooms that have collected on the water's surface, and piling them into mounds every few yards (see Figure 43). The work is conducted almost exclusively by women, who describe it as extremely unpleasant. Depending on the size of the *gher*, this work may be done every couple weeks to once a month or less. It is carried out my groups of women, usually in groups of about five to eight, starting in the morning around 8am and working until 2pm. They do the work with their saris hitched up around their thighs, but the saltwater eats away at them, and one woman told me that she needs to buy four saris a year now instead of two because the fabric begins to fall apart.

Women in Kolanihat are paid 80 taka per day for their work in the *ghers.* This is significantly lower than what men are paid for agricultural labor (100 to 500 taka/day, depending on the work and time of season), and this reduced rate is the most likely explanation for this gendered division in the labor market. The limited availability of this work in the *ghers* combined with the abundant supply of underemployed laborers also significantly depresses wages in the *ghers*. One woman explained,

> "The gher owners are very comfortable. The big ghers, if they have a good shrimp production one year that money will last them for 5 years. The poor people, those who have to work day to day to earn a living, if they make even the slightest mistake they are kicked out and told they will be replaced by someone else immediately and that they are no longer needed. The owner makes sure that the new people that are brought in are paid even less than what the previous person was paid. Those people have no option but to do the work at the cheaper rate as they have nowhere else to go. They cannot even argue with the gher owner. For the gher owners, if they have a problem with the shrimp production one year, the next year the production is ok. He has money saved up so he can afford to buy shrimp fry and release it in the gher. What can a poor person do if he is forced to do Tk. 100 worth of work for only Tk. 50? He has no choice."

Several laborers also reported having their wages withheld for significant periods of time, even as much as a year, particularly when the price of shrimp is low or the *gher* is struck with a virus and the *gher* owners' income is reduced. The precarious nature of this work is a cause of great concern for residents who have little other income earning opportunities on which to rely. In Salabunia,

another village in Polder 23 that has experienced a similar transition to shrimp (with associated employment and land tenure dynamics), Belton and colleagues report that only two per cent of the jobs available in aquaculture in the village are permanent position, with 61 per cent of laborers working in temporary day labor arrangements in *sheola* and *matir kaj* (described below) (Belton 2016). This contrasts with agricultural positions which are usually contracted on a seasonal basis.

Once, standing at the edge of a *gher* with a woman who was hired occasionally for sheola kaj there, both of us grimacing slightly at the fetid water and the foamy scum collecting at the edges, I asked her if she liked working in the *gher*. She looked at me with a guffaw, eyes wide in disbelief, and asked me "would you like to get into this water?" I looked down, struggling to make eye contact with her, embarrassed to have asked what she obviously thought was a ridiculous question. The problem, she continued, is that only women who do this kind of work in the *ghers*, not men. As a result, the challenges of the work, and particularly the associated health problems, have received little attention.

Figure 43. Gher *covered in algae (left);* gher *in the process of being cleaned, with some algae piled in mounds (right)*

Though women are understandably hesitant to open up about these concerns, they describe skin rashes and gynecological conditions they commonly develop after working in the *ghers*. These concerns were confirmed by a doctor who runs the local government hospital. Upon

walking into this hospital, one is greeted by a large vinyl banner buoyantly describing a pharmaceutical injection called "Pradox," with the tagline "Reactivator for Life" (see Figure 44). The active chemical compound in Pradox, pralidoxime chloride, is used as an antidote to organophosphate poisoning, including chemical weapon nerve agent attacks against military personnel. In Paikgachha, the doctor explained, it is administered to patients, primarily women, who have attempted suicide by ingesting chemical fertilizers used in both aquaculture and agriculture. He estimated that he sees approximately 20 such patients each month (even as he brushed off questions about what might cause this dismissively, explaining to me that women often become hysterical if their husband doesn't buy them a piece of jewelry they want). As he gave me a tour of his hospital, the corridors of which were crowded with recovering patients huddled on mats laid out across the cement floors, he listed the variety of ailments that afflict women shrimp *gher* workers, including skin diseases and fungal and reproductive tract infections, such as leukorrhea, a kind of pelvic inflammatory disease causing discomfort and vaginal discharge. His description aligned with the symptoms women shrimp *gher* workers reported to me, which they described as vaginal infections, "tumors," and excessive bleeding ("*prochur porimane*," one woman said, meaning "enormous amounts"). However, among the women I spoke with in Kolanihat about these medical concerns, none had sought treatment at the hospital, citing the high costs of medical care, out of reach for female shrimp *gher* workers who earn approximately 50 taka per day (approximately 65 cents US), usually for a few days a month or less.[103]

[103] Their failure to seek treatment could also have to do with the miserable conditions at Paikgachha's government hospital and its limited capacity. According to the Bangladesh Bureau of Statistics, the official number beds in this hospital is 60 (BBS 2013, 83), serving a total upazila population of about 250 thousand. There is also a government community clinic where women can seek treatment, but women in Kolanihat said it was very far for them to travel, with transport there costing them 20 taka, which many felt was still out of reach.

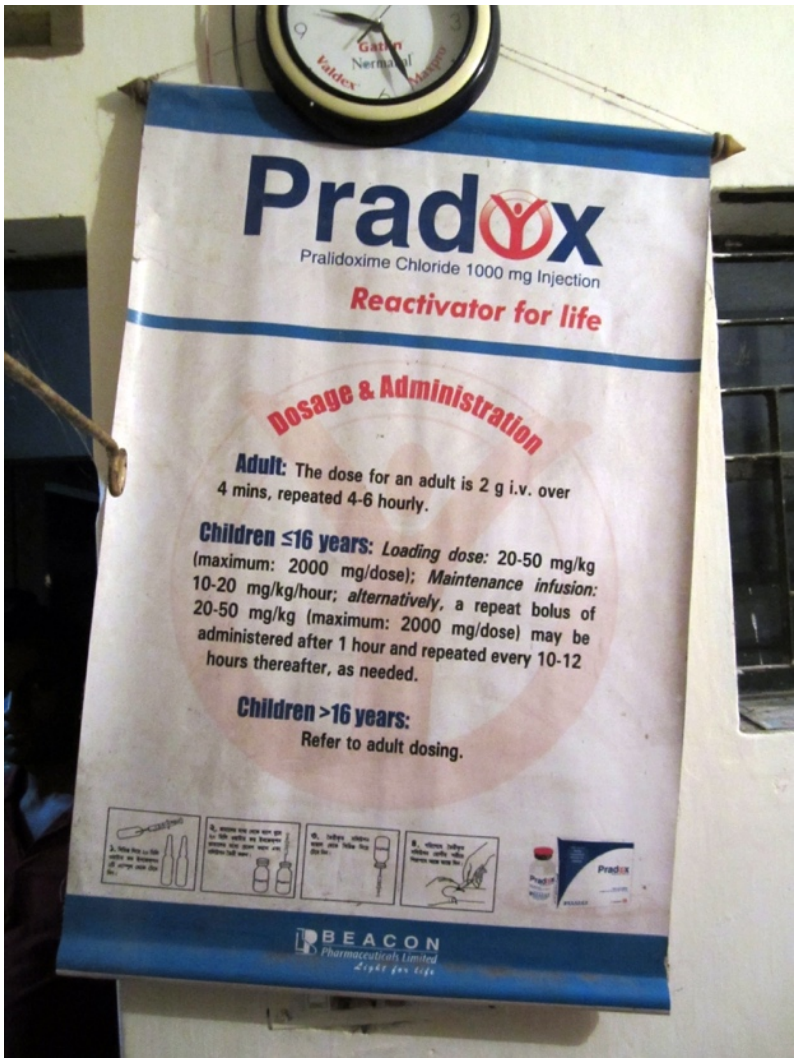

Figure 44. Pradox sign in Paikgachha hospital

Although it is rarely seen in Kolanihat, another source of work for contingent laborers in the shrimp producing areas is in the collection of wild shrimp post-larvae from the rivers, which is done with very fine blue nets fastened to wooden frames that collectors pull through the water along the river bank. They then dump the debris that has collected in the net in a metal basin, then use a spoon to sort through the twigs and other tiny plant and animal life that accumulated in order to pick out the shrimp post-larvae, which are approximately a centimeter long. They are tiny enough that I myself find it difficult to distinguish shrimp post-larvae from the other varieties of larvae present with the naked eye. This work is extremely low-paid and is considered very low-

status, and is therefore often carried out by women and children. Quddus reports that 42 per cent of female fry collectors are widowed, divorced, or deserted by their husbands (making their economic condition particularly precarious) (Quddus 2006). Because the fine blue nets collect all aquatic life indiscriminately, the collection of wild shrimp fry has been blamed for a significant decline in aquatic biodiversity throughout the region (Pokrant 2014), and is likely the cause of much of the disappearance of wild fish stocks described above. While the government has banned the collection of wild shrimp fry for these environmental reasons, the ban is largely unenforced.

While women are responsible for algae work, work in the *ghers* for men primarily involves "mathir kaj," or "mud work." This entails rebuilding the narrow mud embankments, barely wide enough for a person to walk across, one fit in front of the other, and rising no more than a foot out of the water. Composed of the silty alluvial clay that covers the land all over the delta, these squat embankments are ephemeral, dissolving haphazardly under heavy monsoon rains. After the rain, and occasionally in the dry season for more regular maintenance, men are enlisted for a short period to repair them by hand, digging into the silky fallen mud and mounding it back on top, smoothing the ridges with their hands as they go. Their labor is cheaper than a machine which could likely accomplish the task more quickly and durably (and which is used in areas with larger-scale industrial operations than those in Kolanihat). The work itself is needed only occasionally and, like the embankments it produces, is entirely contingent. The earning opportunities it affords are dependent on the vagaries of weather. It does not follow any kind of schedule, like agriculture, with its growing seasons, and predictable cultivation calendar, with work needed for tilling, planting, weeding, and harvesting. This contingency produces deep insecurity, and laborers are unable to rely on it for regular income. It is thus only those laborers whose lives have become most precarious who engage in this work to supplement their livelihoods.

Migration

As suggested in Arjav's story above, this dispossession of the rural poor through the expansion and intensification of shrimp culture has resulted in a mass migration from villages like Kolanihat to urban areas. In some communities in Khulna, landless residents survive through seasonal migration for agricultural labor of some male family members, this is less common in Polder 23, given the lack of subsistence and day labor opportunities to sustain their families *in situ* (Paprocki and Cons 2014). I heard a handful of reports of people migrating to the nearby district of Gopalganj, where vast tracts of lowland create the conditions for abundant rice production and high demands for labor. However, most people from Polder 23 migrate to Kolkata, in the neighboring Indian state of West Bengal. Residents explain that at the beginning of the shrimp boom, the majority of these migrants were the newly un- and under-employed landless people. As fewer of them remain, the flow of their out-migration has waned. Today, it is primarily the young sons of shrimp *gher* operators who are leaving Kolanihat in search of work. When I asked their families in Paikgachha why their sons migrated, the most common response was "because of poverty." One mother explained to me soberly, "we don't have any work here. We have to eat. Because of that, they are going to India." Another person told me "their livelihoods depend on it."

The primary destination for these migrants is a small enclave[104] within the aptly-named New Town, a planned satellite city on the outskirts of Kolkata. There could perhaps be no better archetype of "New India" than New Town. The city has sprung up rapidly in the wake of Kolkata's burgeoning IT sector, which claims an annual growth rate of 70 percent (World Bank 2014b, 214) (see Figure 45), manifested by names displayed on apartment blocks such as "Website Housing" and "TechnoNest." Both the Congress and BJP governments have undertaken programs labeling

[104] Although it is well known in the area, I do not name the area within New Town where these migrants live in order to protect their identities.

New Town a "Solar City" and "Smart Green City," representing its important role as a model for visions of urban development in New India (Chakraborti 2014; Bagchi 2014; Chakraborti 2013). The city was formally established in 2007, after annexing a vast tract of farmland near Kolkata's airport. According to Dey, Samaddar and Sen, in preparation for building New Town, the government of West Bengal used colonial-era land laws to requisition over 3,000 hectares of land, displacing 131,000 rural residents (Dey, Samaddar, and Sen 2013, 3). Today it is a patchy urban jungle of sparsely inhabited concrete malls and apartment blocks towering as many as 20 stories high. These construction and residential zones are interspersed with residual farmland still being used to graze cattle and for the cultivation of crops in handful of isolated spots. Besides this, there are few traces of the area's agrarian past, although a small number signboards posted on roadside shacks proclaiming "Land Losers' Cooperative," are evidence of the dispossession that took place here, set up by associations of farmers whose land was grabbed to make way for this new city. New Town is as much constitutive of visions for India's developed future as Khulna's shrimp landscape is of visions of the same for Bangladesh. Given the relationship between these dynamics of rural dispossession and urban growth, it is fitting that Khulna's migrants should come here in search of new earning opportunities.

Everyone in Kolanihat knows people who have come to New Town, and many of them keep in touch across the border by cell phone. It is through one such contact in Kolanihat that I got in touch with Shonjoy, a young man who came from Kolanihat about three years prior in search of work. His story is typical of those shared with me in approximately 20 interviews I conducted with migrants in New Town.[105]

[105] These migrants were identified through a snowball sample as an extension of my field site in Kolanihat, not as a representative sample of migrants in Kolkata.

When I visited Shonjoy's family at their home in Polder 23, they told me about their struggles with shrimp cultivation that led to his migration. Before the shrimp boom, Shonjoy's father had farmed rice on a sizable 12 bigha plot that they owned, supported by hired labor from four landless community members. Debjit, the land grabber from a neighboring village mentioned above, took control of their land using a similar legal maneuver through which their land title was fraudulently signed away. During the period following the seizure of their land, Shonjoy's father engaged in mud work and other kinds of manual labor that they found inadequate for sustaining the family.

Figure 45. New buildings under construction in New Town

Along with a campaign of other neighboring smallholders whose fields had been seized by Debjit, they worked to wrest control of their land for about 12 years. Through this collective pressure, the land was finally returned to them. Now, Shonjoy believes that about 40% of the land

in their area is controlled by smallholders like them in small plots of around 10 bighas. Before they got their land back, Debjit had absorbed it into his own neighboring *gher*, where he had cultivated shrimp for the entire period without flushing the salt water. By the time they got their 12 bighas back, they weren't sure whether they could do anything but continue cultivating shrimp on it, and they said they also didn't have a choice. Shonjoy said his father attempted to farm *aman* rice again about six years after getting their land back. However, his efforts were undermined when vandals (presumably hired by Debjit) cut the small embankments bordering his fields in the middle of the night, inundating his rice paddy with saltwater again. The entire crop died. So, they explained to me, despite their great aversion toward shrimp, they felt that rice wouldn't be an option to them. Debjit continued to manage a 400-500 bigha *gher* immediately adjacent to theirs, so they explained that there was no way for them to make the decision on their own not to cultivate shrimp, despite having repossessed their land. Shonjoy said that perhaps if they along with all of their neighbors decided to collectively cultivate rice, they might have a chance of successfully returning (though they would still run the risk of having their embankments cut and fields flooded).

Since then, they have operated their own small *gher* on this land. Yet, they struggled to make the investments needed to run a profitable *gher* business. Shonjoy's father took some loans to try to make bigger investments with the hope of greater success, such as buying improved feeds and fertilizers, and superior *pona* (shrimp post-larvae) from hatcheries. Yet, despite their efforts, they repeatedly met with losses. The shrimp business does not provide a sufficient livelihood to sustain the family, Shonjoy explained to me. He speculated that he could have tried to stay in the village and work as a middleman, buying shrimp from neighbors and selling it to traders in Paikgachha town. He said, however, that he didn't want to do this kind of work; it is economically risky, vulnerable to frequent shrimp virus attacks, and rarely provides sufficient income to meet financial needs. Faced with a failing shrimp enterprise at home and the family's significant debt to

be repaid, Shonjoy left for New Town to earn money to send back to the village. “How else would we eat?” his father asked me, distressed but resigned. This was a common refrain throughout the area, particularly for those whose relatives had been forced to leave to support their families.

Figure 46. Construction workers in New Town

When I got ahold of Shonjoy on his cell phone in Kolkata, he told me to meet him one evening at a large, central bus stand in New Town. He seemed cautious but amenable to telling his story, and excited to hear that I had visited his home. Shonjoy first came to Kolkata with his older brother, who has since gone back to their village, so now Shonjoy lives there alone for most of the year. When they first came, Shonjoy found work in a power plant, and now he mostly works in construction. In New Town, even as a contingent day laborer, he found that he could secure daily or weekly contracts paying as much as 400 Indian rupees (US$6) per day, working seven or

eight hour days. Construction work in New Town's concrete jungle is readily available, and there is a local labor market where contractors explicitly hire Bangladeshi migrant workers.

I asked Shonjoy whether he had thought of going to Dhaka to find work instead of migrating to Kolkata. He said that he knows some people from Paikgachha work in garment factories in Dhaka, and he considered this. Once he went to Dhaka to interview for a job in a garment factory, but he didn't get the job, and was unhappy with the anticipated working conditions, which involved 12 hour days for 8,000 taka per month, just over US$102, still higher than the national minimum wage.[106] Most of the jobs he could get in Dhaka are garment jobs, he said, and they don't pay well. He also placed great value on the work schedule in Kolkata, with most days starting at 10:00am and ending at 5 or 6:00pm (this schedule is clearly not universal, however, as several other migrants reported to me working until 8 or 9:00pm). Yet, there are higher risks and costs involved in traveling to Kolkata than to Dhaka, in particular the 1,600 taka he has to pay someone to be transported across the river by boat. For this reason, he doesn't return home for visits, although he said that some people do go home for Durga Puja, the most important religious holiday for Bengali Hindus.

These migrants, however, do not live in the "Website Housing" nor "TechnoNests" which they are building, rather in densely-packed shantytowns on their outskirts. In these settlements, which they refer to as "gram" or "village," connoting their simplicity, migrants crowd together into small corrugated metal huts and creaky, swaying bamboo structures, many of which are perched precariously over open sewage canals. One such shanty where Shonjoy took me to meet with a group of migrants from Paikgachha was lit by a single light bulb hung from the ceiling, and had space for little more than a double bed and three plastic chairs they brought in from neighboring

[106] As of December 2013, the minimum monthly wage for garment workers in Bangladesh is only 5,300 taka, or about US$68, though men are typically paid more than women, who make up the vast majority of the workforce.

dwellings. The air was stifling despite a small electric fan, and a large stack of bedding folded up in a pile on the bed made it clear that at night, the entire space must have been covered with sleeping bodies.

Despite anti-Bangladeshi xenophobia that infuses the national political discourse in India, Shonjoy explained that the local police don't bother them, recognizing the urgent demand for their labor in the construction of New Town. I asked him if he felt that he was competing for work with Indian labor migrants, such as Biharis, who are considered the other most visible migrant group in Kolkata. He said that there were jobs open to Biharis that he can't do as a Bangladeshi, such as taxi driving and domestic work in private homes, both of which might require him to present immigration documentation. He said that the demand for the kind of contingent and low-paid labor provided by Bangladeshi migrants was high enough that it outpaced the supply of domestic migrants. Indeed, Mitra's study of migrant workers in Kolkata confirms a hierarchy of informal labor in the city, in which construction work is largely performed by the most contingent, temporary migrants (Mitra 2016).

Shonjoy regards questions about his future pensively. He is not optimistic about Kolanihat's return to rice farming. He said that his father usually comes in November and stays for 1-2 months; this is the lowest season in *ghers*, because the cold weather prevents the shrimp from growing, and as a result there isn't work to be done then. During this time his father stays with him and they both find work in the daily labor market. Even as his father returns home to continue the *gher* business, Shonjoy believes that it won't be viable in the long-term. Unless somehow the entire village decides to begin farming rice again, he explains, there will be no long-term future for them there. The migrants in New Town express mixed optimism about this possibility of return. One young man whose father and brothers have stayed in Khulna to manage a *gher* volunteered to

me that he would return to the village if they could farm rice again. But then he told me that he didn't think that return would be possible.

Shonjoy's story reveals the political economic dynamics driving migration out of Khulna's shrimp producing region. While these migrations are clearly linked with changes in the local ecology, calling them climate migration obscures the production dynamics which motivate dispossession across a range of rural classes. Thus, understanding the agrarian political economy of shrimp production sheds light on the broader demographic shifts taking place in this region, and calls into question claims of massive out-migration from the coastal region being driven by climate change.

Conclusion

Shonjoy represents the new face of agrarian change and dispossession in Khulna. Through the incursion of shrimp farming, even the livelihoods of those families whose landholdings once ensured their economic security have become tenuous. With these uncertain economic prospects, the younger generation are leading an urban transition driven not by personal choice, but by economic compulsion. The failure of most development agencies to acknowledge these social and ecological contradictions, and the political economies in which they are embedded, has facilitated the expansion of shrimp culture. Thus, the antithesis between shrimp and rice cultivation has both material and epistemological dimensions, and manifests both socially and ecologically.

While the analysis of this process among NGOs promoting shrimp aquaculture and that of local communities is quite different, the empirics of the transition are in fact for the most part uncontested. Many NGO researchers, aware of the labor transitions taking place in the shift from rice to shrimp, celebrate the increased "productivity" associated with the labor market changes. WorldFish, a member of CGIAR (the Consortium of International Agricultural Research Centers), is

one of the primary institutions driving the expansion of aquaculture in Bangladesh as well as globally. At a WorldFish workshop I attended on the topic of “resilience,” one researcher described the decline in rural labor opportunities through aquaculture intensification as more "sustainable" because "less people have hard livelihoods" when they are removed from agrarian production systems. This comment is not unique among researchers and practitioners working in aquaculture development in Bangladesh. Even as development agencies express concern for and intention to serve the poorest, aquaculture development programs consistently marginalize the landless, reflecting the pervasive disregard of these groups as constituent participants of agrarian economies.

This apparent blindness is reflective of a broader vision of rural development. Speaking the language of income diversification, development practitioners celebrate the de-agrarianization of rural labor markets, and the movement of all classes into non-farm livelihoods. The manager of one shrimp development program explained to me that the labor market transition resulting from the expansion of shrimp is a benefit to rural economies because it allows people to leave to seek out higher paying work, as opposed to agricultural work which is the "least rewarding financially." When asked about the impacts on the rural poor who would be displaced, this expert candidly responded "that doesn't concern me," explaining that reduced labor demand means profitability increase. These comments reflect a fundamental difference in understandings of who is and is not part of an agrarian society, and of who does and does not have the right to be a farmer. To these development agencies, farmers can only be landholders. This is at odds with the traditional understanding in Bangladesh that all people who participate in agrarian economies are peasants.[107] The poorest members of these communities have historically claimed rights to

[107] As Chatterjee and Hashmi have explained, this identification of the poorest members of the rural society with the peasantry of Bengal at large was fundamental to nationalist politics in anti-colonial struggles as well as in the formation of an independent Pakistani state (Hashmi 1992; Chatterjee 1994). For Hashmi, this

participate in rural economies as farmers, a participation which was necessary given their very sizable proportion within the agrarian class structure.

This tension was illuminated in another conversation I had over dinner with a scientist from an elite European university who was visiting Bangladesh for the first time, supported by a multi-million dollar grant from a foreign aid agency, in order to study solutions to problems related to climate change in Bangladesh. The scientist explained to me his research team's plans to work in two sites: first, in a rural community somewhere in the coastal zone, and second, in collaboration with garment manufacturers, to help support the growth of Bangladesh's garment industry. The logic of this pairing is quite clear, as the scientist explained to me: "The history of development is the history of moving people out of agriculture." To this scientist, he and his team of researchers can promote what he refers to as "progress" by supporting development which facilitates the transitions of large populations of Bangladesh's rural workers off of the farm and into the garment factory. His comments illustrate a much broader vision of development in Bangladesh, of which the expansion of aquaculture is just one part.

historic identity formation affirms Shanin's theses on the peasant class as a political force (Shanin 1966). Hashmi explains that this unity of the collective identity of the peasantry was particularly strong in Khulna historically because the rent-receiving *zamindars* and *talukdars* "had to be 'benevolent' landlords, as they needed the support of their tenants in the construction of embankments or *bundhs* to prevent saline water from entering the fields" (Hashmi 1992, 39). Chatterjee explains, however, that this unity was extended only to the Muslim rent-receivers, while Hindu landlords were not considered part of the peasant community (Chatterjee 1994, 11). Chatterjee argues that this aspect of peasant consciousness, grounded in "an entire set of beliefs about nature and about men in the collective and active mind of a peasantry," is fundamentally religious, rather than being based on a consciousness of class differences within the peasantry. He traces the communalism in Bengal that in part led to the formation of independent Indian and Pakistani states to this particular form of peasant consciousness in the region.

CHAPTER 6

"WE HAVE COME THIS FAR, WE CANNOT RETREAT:" ADAPTATION, RESISTANCE, AND COMPETING VISIONS OF TRANSFORMED FUTURES

Benoy came running as soon as he saw me walking down the path that bordered his field, waving his arms animatedly. All of Tilokpur was buzzing, working feverishly: the harvest was good. Better than it had been in 30 years. Good enough to confirm what they all hoped but no one knew: that agriculture is still possible in their village. It was late April of 2015. From approximately 1985 to the mid-late 2000s,[108] the rice fields of this village, which had historically produced two to three crops per year, had been taken over for shrimp cultivation. Through the collective and ongoing efforts of the landless social movement groups supported by Nijera Kori, Tilokpur smallholders began farming rice again in 2009. Benoy himself had been doing so since 2012 on one *bigha* of land he owns and three that he sharecrops. The pace of the work on this day was particularly frenzied due to the accumulating clouds in the sky that had everyone worried about rains rotting the cut stalks of rice before they could be bundled and hauled from the fields. For nine years prior to this return to rice farming, Benoy had been forced to migrate out of Tilokpur to earn money to support his family. He traveled to a market on the outskirts of Khulna city, where labor contractors hired him to do road construction work. He didn't enjoy this work, he said, not least because it was very risky, and because it meant he had to stay away from home for most of the year. Now his harvest was good enough that he could stay in Tilokpur year-round.

[108] Exact dates for the end of shrimp cultivation are difficult to pinpoint both because residents' recollections vary and because the transition back to rice was slow and did not take place all at once. Given the ongoing water management conflicts, it would be fair to say that the transition is ongoing even now. For the most part, however, farmers in Tilokpur shifted back to rice from shrimp sometime around 2009-2010, with a number of stops and starts both before and after.

Figure 47. Rice in Tilokpur

Figure 48. Loading harvested vegetables onto a rickshaw in Tilokpur

Benoy's wife, Titash, is a leader in the local landless collective. An ardent feminist, Titash has a serene but commanding presence, and though she is soft-spoken, people listen intently when she talks. I once saw her have an irreverent but spirited fight with an elderly male leader about whether men or women have more suffering in their lives. In response to an off-handed remark he made that women don't suffer because they don't have to work, Titash delivered a calm but incisive and withering lecture on the political economy of household labor. The lecture ended on the agreeable note that one way they work toward mitigating these imbalances in her household is by all eating meals together at the same time, an almost unthinkable practice in rural Bangladesh, where female members of the family eat meals after serving male family members, as a matter of course. Beyond its significance in her own person life, household labor is, for Titash, critical to Tilokpur's political and existential struggles. During the years that Benoy migrated out of the village for work, Titash stayed home with their children and struggled to find ways to feed the family on what meager earnings he could send back to the village.

In rural Bangladesh, though men are traditionally responsible for cultivating rice and other commodity crops, women cultivate the homestead gardens that feed the family year-round, and are often also responsible for rearing livestock. During the time of shrimp cultivation, homestead gardening and livestock rearing had become increasingly impossible, due to the rising soil salinity that crept into homesteads from surrounding shrimp *ghers*. Now that Benoy was back and the harvests were getting better, they had money to invest in livestock again. Titash had purchased three cows that she was successfully raising for milk for the family to both consume and sell. The cows grazed on the grass that had started to grow again as the soil salinity declined, and on the chaff from the rice harvest. Her garden was flourishing. For Titash, and other women who had stayed in Tilokpur while men had migrated out, the challenges of social reproduction in the

shrimp-producing period were just as great as the challenges of agricultural production in the midst of ecological collapse. Indeed, they could not be understood independently of another.

Benoy wasn't the only one who left. During the shrimp producing period, most residents who had previously been dependent on agricultural day labor, particularly the men among the approximately 60 landless households in the village, were forced to migrate out of the village to find work. As one landless laborer described in 2013,

> "Now people have to leave the area to find whatever work they can wherever they can find work, because for shrimp farming you don't need as many laborers so there aren't many jobs. All the people who have to earn daily wages are still working outside, myself included, despite the fact that shrimp farming has stopped for two years. This is because it has yet to go back to the way it was before. And there are people who keep trying to open the gates."

These people went to Khulna city like Benoy, to Dhaka, or to India. Given the ecological conditions in Tilokpur linked with their migration, it is not difficult to imagine these people being classified as "climate migrants." Yet, the conditions motivating their decision to migrate were clearly much more complicated. By 2015, all of these people, including the landless, had returned, finding ample employment opportunities in the gradually restored agricultural fields.

History

Tilokpur lies within Dumuria, a subdistrict of Khulna on the inland edge of Bangladesh's coastal zone, in Polder 29. Due in part to its location further inland, the shrimp aquaculture boom came to this area later than adjacent com1munities closer to the coast. The brackish waters of the coastal region become less saline further inland, making saline water inundation of agricultural lands (to fill shrimp *ghers*) less convenient. Dumuria is bordered to the west by the Gangrall river, one of the countless tidal channels at the base of the delta of the Ganges-Padma river system.

Tilokpur is a historically rice-producing area, facilitated by abundant rain in the monsoon season as well as ample freshwater supply from the dense network of rivers and canals, which

supports additional crops during the non-monsoon seasons. The most intensive cultivation takes place within a very large lowland area known as Boro Beel (literally "big marsh"), surrounded by settlements and canals on all sides. Depending on the exact geographic location of their fields, farmers in this area report that they historically were able to produce two or three crops per year, including rice, lentils, sesame, watermelon, and a variety of vegetables and leafy greens. During the time when shrimp was produced in this area, the low elevation of Boro Beel facilitated the sustained saline waterlogging which is necessary for shrimp cultivation, while also severely impairing continued agricultural cultivation.

Figure 49. Shrimp ghers *in Tilokpur in 2012*[109]

[109] This picture, taken in 2012, depicts some of the last remaining shrimp *ghers* in Tilokpur. Although most of the village had transitioned back to rice already by this time, the impacts of shrimp could still be seen at

Commercial shrimp production began in Tilokpur in approximately 1985, and continued into the mid-late 2000s. It began much like in Polder 23, through the instigation of outsiders with the support of several elites from the local area. As one resident explained,

> "We first had the WABDA [sluice gate], very few influential people got control of it and started bringing salt water in to start farming shrimps. When they started, .it was profitable. Then they had hired thugs who would go around the area and take land by force for expanding the shrimp farms. After taking over the land they brought in the salt water by cutting the embankments. After a while people began to notice that crops stopped growing. This is because of the salt in the water, nothing grew after a while. Neither trees nor fish grew… Some people in the area were willing to give 5 bighas of the land to them, but they took 10 bighas by force. This is how they took land by force."

The support for shrimp cultivation among local residents was driven primarily by wealthy landholders from an adjacent village located on the opposite side of Tilokpur from the river. Among these, the most powerful is a man named Imtiaz Saheb, whose wealth allows him to wield great control over a variety of local concerns beyond the conversion from rice to shrimp. For example, a group of landless group members told me (with considerable dismay) that Imtiaz was allowed to be present at the interviews of all candidates for teaching positions at the local school, leading them to raise questions about several issues in the administration of the school (explored further below).

In addition to water being intentionally brought in to flood the shrimp *ghers*, at one point the embankment also collapsed because the *gher* owners had drilled holes in it to install large PVC pipes to bring in the salt water, which weakened them. The collapse of the embankment caused the entire area to flood. As one resident explained, conflating the intentional and unintentional inundation, "the water rushes in and destroys our homes, kills trees, animals, everything. The

---

this point. In particular, these *ghers* were on the opposite side of the main footpath through the village from Boro Beel. The path served as a natural barrier to prevent saline water from entering the *beel,* and thus it was not necessary for these plots to participate in the collective transition. By 2014, however, they had all returned to rice with the rest of the village. The picture indicates what most of the village looked like during the time when shrimp was cultivated there.

shrimp farms are always under salt water and nothing can survive this water, even roads and houses collapse in the water." The ecological degradation resulting from shrimp farming as well as the unintentional inundation exhibited itself in Tilokpur in a variety of ways. The slow death of the trees was the most visible of these ecological impacts, and cited most frequently by village residents. As one farmer explained:

> "The first year shrimp farming started, the trees were okay but they stopped bearing as much fruit. By the next year, not only did the fruits stop growing, but the trees started dying. The leaves first started discoloring, then the branches started drooping. Slowly the tree itself died. Our orchard was completely gone."

Despite the ecological crisis that the area experienced due to shrimp production, many farmers attempted to continue growing *aman* rice during the monsoon season, when shrimp production is less profitable, due to heavy monsoon rains decreasing salinity in the *ghers*. Rice yields were so low during this time that most farmers reported suffering an annual loss. One day laborer described the conditions during this time as such,

> "But the situation with the crops became like this, not even 2 *maund* of rice would grow on 1 *bigha* of land.[110] I had no work, I would go to areas outside to find work. Unless you saw it for yourself you can't imagine how much I had to struggle to survive. I can't even describe to you how I suffered. I am trying to give you an idea with just my words how hard I had to work to stay alive."

This testimony reflects the importance of labor opportunities in rice cultivation for landless day laborers. In the context of such low yields, farmers growing rice don't require assistance from day laborers with harvesting. Opportunities for sharecropping (upon which many landless and land-poor households had previously depended) disappeared, as the shares of rice for both land owners or sharecroppers themselves dwindled to next to nothing, and land owners became increasingly reticent to lease out their land under sharecropping arrangements for rice farming.

[110] One maund is approximately 37 kg, and one bigha is equal to 1/3 acre. A good rice yield during this season is considered approximately 18-22 maunds, depending on the variety of seed used.

Despite the struggles these farmers endured and the exceptionally low yields, their persistence in attempting to drain the *ghers* of saline water annually before the monsoon helped to flush some salt and chemical residue from the soil. This practice protected Tilokpur's soils from some of the worst ecological impacts suffered in other shrimp-producing areas, and may be a significant basis of their ability to transition back to rice.[111] Although some researchers have found that annual flushing of salinity from the soil up to 4ppt is possible (more on this in Chapter 4) (Clarke et al. 2015), very little is known about whether there is a point at which return to agriculture is impossible, and how and when that point is reached. As one official at the Department of Agricultural Extension put it to me, "we have very primitive knowledge." The cases of villages in Dumuria and Dacope that have returned to rice from shrimp offer a counterfactual to claims that agriculture is no longer viable in Khulna's shrimp growing regions. I frequently raised these cases with practitioners in response to such claims; in response, they would usually accede the possibility, though question whether most communities would have the stamina to survive several years (no one could know how many) of low yields while they waited for their soil to regain its former fertility. However, my interviews with agricultural development practitioners indicate a belief that intrusion of salinity into the underground aquifer would make the return much more difficult, if not impossible, as salinity in the groundwater would for the most part preclude dry season agriculture. This would suggest that Tilokpur's aquifer successfully withstood the salinity of the shrimp farming period, and that they have this at least in part to thank for their successful return to rice.

One of the most insightful conversations I had in Tilokpur about the discrepancies between rice and shrimp production was with Khokhon, a rickshaw van[112] driver who I met one day while

[111] For reasons explored in Chapter 4, most assumptions about the possibility and process of return to agriculture in communities like Tilokpur are entirely speculative, and subject to the politics of uncertainty.
[112] A bicycle pulling an attached flatbed, used for hauling produce and other cargo.

he was transporting several bushels of vegetables to the market. As we walked and chatted, I asked Khokhon what he thought about rice and shrimp. This seemed like a question with a fairly self-evident response. As a rickshaw driver, I anticipated that Khokhon's attitudes about shrimp might have been more moderated than those of his neighbors who depended on agricultural labor. Rickshaw van pulling is commonly cited as the primary form of work for which demand increases within the village in the transition from rice to shrimp, because shrimp, unlike rice, is harvested year-round and requires prompt refrigeration, so there is an increased need for people to regularly transport what is produced in the village to nearby markets for sale. Indeed, Khokhon confirmed, as a small but critical link in the export shrimp value chain, he made more money than ever before or since. As a participant in the agriculture value chain, his labor is only required infrequently for transporting the harvest to market, primarily for periods of a few weeks three times per year, and besides that for various *ad hoc* needs of fellow villagers.[113] Yet, Khokhon looked at me incredulously when I asked him this question. During the shrimp time, everyone in the village experienced *obhab* (অভাব), meaning deficiency, dearth, or scarcity. He described *obhab* as a generalized condition, one which affected the community as a whole, even the few like him who profited financially. During that time, the only way he could get food was by buying it in the market from people who brought it in from outside, as nothing was growing in the village's fields or gardens. This meant that food prices were much higher. But now food in the market is cheap, he explained, as people in the village are growing a surplus, and he can thus purchase rice and vegetables in the market quite inexpensively, or barter the services of his rickshaw. Though the cost of food and other necessities was not out of his reach during that time, owing to his increased

[113] There are considered to be three primary growing seasons in Tilokpur; however, given the variable schedules of different vegetable harvests, a rickshaw might be needed to transport harvests more frequently, depending on the diversity of planted crops and their growing seasons in a given year. Rickshaw van drivers are also occasionally hired by village residents for personal transport or other needs, so this is not a dependable or lucrative source of income.

income from his rickshaw van, it was nevertheless unfavorable for him as it was for his neighbors. In explaining this shift to me, what he most seemed to want me to understand was that what was good for his community was what was good for him.

Movement Against Shrimp

Responding to this environmental degradation in the midst of displacement and personal economic difficulties, residents of Tilokpur faced a protracted struggle to return to rice cultivation. One woman told me that they were inspired to act by stories they heard from residents of Polder 23 about the extreme degradation they had experienced. The opposition to shrimp cultivation was spread across a broad base of local class interests. In addition to the Nijera Kori landless collectives, there was also a group that called itself the Saline Water Resistance Committee, composed of people who were too wealthy to be eligible for Nijera Kori membership, such as teachers and smallholder farmers. One of these people described their mobilization,

> "The first year shrimp farming started, the trees were okay but they stopped bearing as much fruits. By the next year, not only did the fruits stop growing but the trees started dying. The leaves first started discoloring, then the branches started drooping, slowly the tree itself died. Our orchard was completely gone. After that the few of us got together and decided, with the help of Nijera Kori's landless organization, to close of the gates bringing in the salt water. We keep closing it, the shrimp farmers keep opening the gate to bring in salt water. It has been 3-4 years, and we had to go back and forth closing and opening the salt water gates. But finally we have been somewhat successful. The salt is slowly going away, we have started planting trees, rice is growing as well."

As this smallholder farmer notes, by 2013, the ecological conditions had improved significantly, and Tilokpur had begun to look quite different from the reports of the ecological collapse during the shrimp period. While some trees had indeed died, farmers were excited to find that most had begun sprouting leaves again, and many were even bearing fruits. Whereas the saline water had killed most grass and other plant life in the areas surrounding the *ghers*, by 2013, most of the landscape was again quite green and lush. The return of rice cultivation, as well as grass and

shrubs, made fodder available, creating opportunities for farmers to once again raise poultry and livestock. In 2013, one farmer explained "some people have started keeping cows and hens, now that grass has started to grow, but only a few people have started." Thus, Benoy's enthusiasm two years later in 2015 reflects not only the joy of the successful harvest, but the success of this protracted struggle which these families took individually and collectively, despite uncertainty about the potential for such a robust ecological recovery.

Yet, as the smallholder above points out, even as they have been successful in their return to agriculture, the movement against shrimp is ongoing. In one village next to Tilokpur, where many local residents had also joined the anti-shrimp movement, farmers woke up one morning in April 2015 to find that in the middle of the night, someone had drilled a pipe into the embankment and flooded their land with salt water to try to force a return to shrimp. Though residents plugged the hole immediately, and the water dried up quickly, the salt, still visible in chalky deposits covering the soil, would make it impossible for them to grow rice or vegetables that season. Men from this village continued to migrate out to Gopalganj, Khulna, and Kolkata to find work.

One small farmer was singled out for harassment and intimidation by a wealthy businessman who wanted to appropriate a piece of his land to build a canal to bring salt water for a *gher* in another adjacent village. He showed me a stack of legal documents related to a series of false criminal cases that had been filed against him with the local police. This kind of judicial harassment is a common means of coercion against the poorest, for whom even the obligation to travel to government offices in a nearby town to contest a false charge can be punishing burden of time and travel costs. Nijera Kori supports people subject to this kind of harassment both through contributing funds to cover expenses related to travel and legal fees, as well as by connecting members with legal aid support, particularly from the Bangladesh Environmental Lawyers Association (BELA), an advocacy group that has led several major cases against shrimp

aquaculture at both local and national levels. This farmer received special support from the local landless groups because their opposition to using the canal for salt was linked with advocacy to have it excavated for rainwater collection to expand the irrigation area. They referred to this as the *Khal Andolon*, or Canal Movement (such struggles over canal excavation are explored in greater detail below).

Figure 50. Anti-shrimp rally poster on a house in Tilokpur

Mobilization Beyond Shrimp

While the movement in Tilokpur was catalyzed around a demand to transition away from shrimp and back to rice production, its demands did not end there. Understanding how the

movement's concerns with ecological destruction caused by shrimp cultivation are entangled with a host of other social and economic struggles is essential to understanding their motivations and, more broadly, the nature of human-environment interaction in the region. This attention draws on a tradition in political ecology which investigates material foundations of environmentalism in peasant and indigenous social movements (Baviskar 1995; Martinez-Alier 2002; Peet and Watts 2004; Rangan 2000). The "environmentalism of the poor," Martinez-Alier explains, derives from an ethics of demands for social justice among humans, not from some inherent reverence for Nature (Martinez-Alier 2002). Similarly, the movement in Tilokpur has challenged shrimp cultivation on the grounds that it engenders inequitable access to resources and livelihood opportunities among community members, impacts which correlate (but are not synonymous) with its ecological implications. I bring these perspectives on environmental social movements into conversation with those on resistance in Tilokpur in order to lay the foundation for a discussion of alternative perspectives on the possibilities of climate justice in Bangladesh and elsewhere.

In Tilokpur, the Nijera Kori collective united to mobilize against shrimp cultivation in their village. They developed strategies and skills for activism which made their mobilization more effective. Sometimes this involved protest marches and demonstrations in regional market centers. They also organized watch committees to monitor sluice gates and protective dikes, particularly at night, to ensure that saline water would not be illegally brought in by people hired by would-be shrimp farmers. This often entailed direct physical confrontation by groups and individuals. In addition to these modes of direct agitation, they also learned to use legal channels to support their advocacy. One such channel was the use of the Right to Information (RTI) Act, which was enacted in 2009. The RTI Act gives Bangladeshi citizens the right to request information of public interest from any government or public authority (including NGOs). Several advocacy organizations have begun training citizen groups to use it to hold government agencies accountable for fulfilling

obligations to its citizens, such as provision of social security entitlements. Nijera Kori landless collectives have had success with using the law to press officials for information about entitlements to common land access, government decisions about water management, and other concerns which have a concrete bearing on the cultivation of shrimp or rice.

Having learned how to utilize the RTI Act from Nijera Kori organizers, the landless collective in Tilokpur began putting the principles of the right to information to work in a variety of other contexts. The awareness that information was not only their right, but was also often publicly available, and moreover that it could be used to demand accountability, became a critical plank in their organizing efforts. For example, suspecting that the local schoolmaster was charging excessive fees for administering exams (preventing the children of landless families from being able to take them), the landless collective in November 2014 enlisted the computer teacher to go online to the school district website and find the table of exam fees mandated by the government. After having this chart printed, they enlisted a Nijera Kori staff member to write a formal letter of complaint on their behalf, explaining that the fees being charged were more than double the mandated amount and demanding that they be reduced. Following a contentious meeting with an agitated headmaster who clearly was not prepared for such a sudden shift in power[114], the fees were adjusted to the appropriate rate. In detailing this protest strategy to me, the landless collective members explained that while they had learned about the utility of securing information for pursuing environmental concerns and securing land rights, these strategies were important in relation to shifting power dynamics around a whole range of social and economic issues. Environmental activism was only one piece of a broader vision for social justice. Restoration of the

[114] The headmaster's agitation was also likely due in part to having his authority openly challenged in front of a foreigner. It is also certainly possible that my presence in the room played a part in the success of their request to have the fees adjusted, and that in other circumstances their demands may have required additional or different forms of pressure.

environment was also, then, only one part of a necessary struggle to pursuing their vision of a more equitable agrarian future. Insofar as environmental activism provided the opportunity for expanding their "repertoire of resistance" (McAdam, Tarrow, and Tilly 2001; Wolford 2010), it provided the foundation for a larger struggle for social change.

Polder 22

The first time I visited Polder 22 was in August 2012, at the height of the monsoon. It poured hard without stopping all day, and I was soaked, my cotton *salwar kameez* and long *orna* hanging heavy and cold. We had chartered a boat to take us there, as the roads in this part of Khulna frequently begin to wash away during the monsoon, often becoming completely impassable. For hours all I saw were tall grey mud embankments fading into the river as we passed island after island. These embankments are formed of alluvial soil rendered barren by the salt that seeped into them from the shrimp *ghers* they held in. When we came around the bend in the river and got our first sight of Polder 22, it was, for me, a revelation. In dramatic contrast to the surrounding islands, the embankments of Polder 22 are cloaked in green grass, with trees and settlements rising out of them. There were people, too, despite the steady rain, signs of life which were otherwise sparse in the area.

This anomalous ecology is the result of decades of struggle by inhabitants of the villages of Polder 22. In the 1980s, when the government and development agencies began promoting the conversation of agricultural lands to shrimp *ghers*, in Polder 22 the landless social movement supported by Nijera Kori actively opposed it. In 1976, the Dutch development agency in Bangladesh launched the Delta Development Project (DDP) in Polder 22 as part of its overall portfolio of water management programming (Netherlands Ministry of Foreign Affairs 1996; Sur 2010). One aspect of this work involved the construction of a mud embankment surrounding the

outside of the large polder embankment. Similar to the traditional *oshto masher badh* described in Chapter 5, this embankment is impermanent, and provides additional protection from storm surges and tidal flooding, while also shielding the internal embankment from erosion and breaches. The area between the two embankments was subsequently managed like *khas* land, though technically under the ownership of the Water Development Board. Nijera Kori was engaged to facilitate this project, reflecting broader support among donor agencies in the aftermath of the 1971 Liberation War for more progressive development pathways (in Nijera Kori's case, social mobilization and "conscientization").

Nijera Kori used their role in the DDP to organize landless collectives and help them successfully lobby the government for access to common lands for use in cooperative agricultural production. In exchange for these groups taking responsibility for the manual labor required for maintaining the external embankment, the Water Development Board gave these landless collectives year-round access rights to the ring of land between the two embankments surrounding the polder. Anjan Datta, now a development economist who worked in Polder 22 as a community organizer for Nijera Kori under the DDP in the 1980s and 90s, explained to me that the project facilitated an opening for land access that the collectives were able to transform into an ongoing entitlement. “Once they had established a precedent for working on the land,” he said, “they established their rights to it, and showed that they could manage it effectively.” This combination of leverage from the DDP intervention with community organizing by Nijera Kori (and activists such as Datta) thus facilitated a transformation in land rights in Polder 22 that has continued into the present.

Collectively, these groups farm indigenous *aman* varieties during the monsoon season. During the dry season they cultivate fish, which they bring in by breaking the embankments at high tide to allow native species to flow in, then trapping them by re-damming the embankments

before the tide goes down. The common land between these two rings of embankments is thus essential both to the protection of the polder's inhabitants as well as the production and social reproduction of many of its most vulnerable inhabitants. The groups plan and perform the embankment maintenance in large teams when necessary, as well as individually or in pairs or smaller groups throughout the year as needed. Riding in a boat around the polder, it is common to see at least one or two people out with small spades conducting this kind of repair work.

These landless collectives were thus already quite strong and well organized by the 1980s, when land in surrounding polders began being rapidly converted to shrimp *ghers* through widespread, unchecked land grabbing, primarily by elite urban outsiders (Netherlands Ministry of Foreign Affairs 1996; Paprocki and Cons 2014). By November 1990, this anti-shrimp movement had mobilized in opposition to pressure from Wazed Ali Biswas, a businessman from Khulna city who intended to acquire over 2,000 acres of agricultural land in Polder 22 for shrimp cultivation. On November 7th, this conflict came to a head in a confrontation between the landless collectives and a mob of armed mercenaries hired by Wazed, during which Karunamoyee Sardar, a local landless leader, was attacked, abducted, and presumably murdered.

Karunamoyee's martyrdom thus catalyzed the movement in Polder 22 and beyond. Citing her last words, which are said to have been "we have come this far, we cannot retreat," Nijera Kori members celebrate her sacrifice both to the landless collectives of Polder 22, as well as symbolically to the movement against shrimp more broadly. Her death is commemorated annually on November 7th by thousands of landless movement members who gather in Polder 22 from all over Bangladesh for songs, speeches, and *jatra* street theater performances (see Figure 51). Today, peasant activists thank the sacrifices of Karunamoyee and other leaders for the island's ecological resilience in midst of surrounding destruction. At the Karunamoyee Day celebration in 2014, a landless group leader from Polder 22 roused the crowd gathered from areas long taken over by

shrimp *ghers*, gesturing toward their fields bursting with the *aman* rice crop, "You can see how beautiful our environment is here in Polder 22...we have goats, cows, chickens, and sweet [fresh] water... It is because of our leaders that the environment is still so beautiful here!" In articulating this history of ecological protection through collective mobilization, activists enjoin their neighbors from surrounding communities to organize in their own villages.

Figure 51. Karunamoyee Day 2014

This narrative suggests a radically different interpretation of the drivers of environmental change in the coastal region than that of the popular imagination of climate crisis offered by development practitioners and in media accounts. The activist narrative undermines the "common sense" of climate crisis by suggesting that it is neither natural nor inevitable. More significantly, it emphasizes the role of social mobilization in protecting the environment from degradation. This

emphasis also suggests important dimensions of their alternative vision for the future of this region and production and social reproduction within it.

Figure 52. Monument to Karunamoyee in Polder 22

Landless groups in Polder 22 continue to pursue this vision of ecological alternatives both through resistance to shrimp cultivation as well as a variety of collective agricultural activities. During the time of the DDP, landless groups were able to secure access to much of the common land controlled by the government on the island, in particular much of a ring around the perimeter of the embankment. Since then, they have farmed that land together in groups of about twenty (see Figure 53).

Figure 53. Collective rice farming in Polder 22

Datta explained to me in 2015 that the successful environmental preservation of the island (relative to surrounding polders) was due to this "strong social organization" supported under the project, which persists even today. However, he also said that the work to address the political economy of land tenure through this pilot project was not replicated subsequently by the Dutch or other development agencies. In an evaluation of Dutch aid in Bangladesh conducted in 1997, the Netherlands Ministry of Foreign Affairs found that despite the successful organization of landless groups under the DDP, this work was discontinued due to the rapid expansion of shrimp cultivation in surrounding areas, and the apparent possibility of it spreading to Polder 22. The report explains that:

> "In the surrounding polders shrimp cultivation expanded rapidly, putting sever pressure on landowners in the polders to undertake the same activity. Because of this, the evaluation mission questioned the sustainability of the project achievements after its completion. The project was eventually discontinued because the appraisal mission for its third phase shared the same concern, and the Bangladeshi authorities in question did not request continuation." (Netherlands Ministry of Foreign Affairs 1996, 142).

Despite this discontinuation of support, the landless groups organized under the DDP have remained strong, in part through the organizing support Nijera Kori has continued to provide. As described above, in between the double ring of embankments surrounding the island, they grow *aman* rice for about four months out of the year. During an additional six months, they raise fish from a diverse mix of indigenous larvae that flow in from the adjacent river. Some of this fish and rice is sold in nearby markets, but much of it is also consumed by the families of the landless group members, among whom the remaining harvest is split up equally. One member told me that her share of the rice yield was usually enough to feed her family for six months (which supplements the rest of the families' independent earnings and production, either from work in or outside the village, or what they grow in their own personal small plots or gardens).

Another critical aspect of this alternative vision of the agrarian future of Polder 22 is the commitment of landless groups to cultivating indigenous varieties of seeds for rice and other crops. Since the Green Revolution, one of the key tenets of rural development in Bangladesh (as elsewhere) has been the promotion of the use of hybrid seed varieties, which are either imported from outside the country or developed within the country, often using foreign technology. The principal merit of hybrid seeds is said to be that they result in higher crop yields relative to indigenous varieties. Among NGOs working in climate change adaptation, hybrid seeds are particularly celebrated as a solution to addressing some of the worst climatic vagaries, such as drought, salinity, flooding, unpredictable rains, and uncertain seasonal change (Mackill et al. 2010). Yet, many farmers in Polder 22 have shifted not toward these new hybrids, but instead have embraced traditional varieties, and are working collectively to revive them. Whereas farmers have

found that crops grown from hybrid seeds can be destroyed in conditions of excessive flooding, several farmers described to me indigenous strains of rice that within a matter of days would naturally grow in height to reach above flood waters when submerged. They also described traditional varieties which were naturally saline tolerant, more adapted to the brackish waters of the coastal flood plains than new hybrid strains promoted by agricultural extension agents.

Farmers in Polders 22 and 29 cite this natural adaptive capacity of indigenous rice strains as a major reason for their growing interest in cultivating them today. This shift in cultivation has required a collective mobilization to revive varieties that had begun to decline in use, and that do not enjoy the support and dissemination of government and NGO extension agents. This mobilization has primarily taken place through the development of community seed banks for saving and sharing local rice and vegetable varieties (see Figure 56). Though some organizers described to me visions of more formalized institutional spaces for preserving and propagating the use of these seeds, the approximately half dozen seeds banks I observed in the area were housed informally in people's homes (see Figure 54 and Figure 55). Rice seeds are often stored in traditional earthen vessels, while less ubiquitous vegetable seeds are kept in repurposed plastic bottles, bowls, and crumpled up pieces of newsprint and fabric. The ad hoc system of revolving dispensation involves farmers depositing particular seed varieties after a harvest, borrowing from the bank again the following season before planting, and then re-depositing a portion of their successfully harvested seeds. The success of this system is contingent on the unique feature of indigenous seed varieties to be saved from season to season, unlike hybrids, which lose their high-quality characteristics when saved between generations, requiring farmers to buy new seeds annually.

Figure 54. Home seed saving in Polder 22

Figure 55. Home seed saving in Polder 22

Figure 56. Nijera Kori collective seed bank in Polder 22

Canal Movements

Another critical component of the agricultural capacity in both Tilokpur and Polder 22 involves the presence and excavation of canals that, in addition to facilitating drainage, also store and supply fresh water throughout the year. In Polder 22, the capacity at the northern end of the village to farm winter crops is facilitated by a canal that runs diagonally through the polder, dissecting the village from top to bottom. The canal connects with the river through a sluice gate on the west side of the polder that is opened during the monsoon, when it fills with fresh water (both from the river and from natural drainage of rainwater into it). However, at the southern end of the village, the canal has filled with sediment, causing its bed to rise, its width to narrow, and its capacity to reduce to such an extent that it quickly dries up shortly after the monsoon. This process of sedimentation is an unexpected result of the polder system, examined in Chapter 4. The reduced velocity of water within the canal (caused by the hydraulic system inside the polder being cut off from the outside) results in a reduced capacity to flushing the sediments out, and they are instead deposited within the canal. As a result, the lack of available fresh water at the southern end of the island during the winter means that most of this land lies fallow during the dry season.

The remedy for this sedimentation problem is fairly straightforward: the sediments can be excavated from the canal. This can be done either by hiring local laborers (certainly the preferred option among local residents), or through the use of dredging machinery. Excavation of the canals was among the greatest demands I heard from villagers throughout the coastal region, in a variety of different ecologies and production systems. In the parts of the coastal zone where the rivers run saline in the winter, the storage of fresh water during the dry season adds an extra crop to their annual production calendar, meaning that farmers could as much as double their incomes over the course of the year. At a conference on the Ganges Coastal Zone organized by the CGIAR consortium in 2014, one researcher from the International Water Management Institute (IWMI, a

member of the CGIAR consortium) cited an unpublished study indicating that these canals can store enough water to irrigate a full crop of winter *boro* rice in 25 per cent of the area, and that this area could be increased to 40 per cent if the canals were properly dredged. The researcher argued that these findings undermine common perceptions that water resources are a constraint to production in the coastal zone. At this same conference, a researcher from the Bangladesh Agricultural Research Institute (BARI) explained that even canals filled with low to medium salinity water could be a good source of irrigation for more saline-tolerant winter crops like wheat, mustard, and watermelon.

The major challenge to pursuing these options is a vacuum of responsibility for carrying out this essential infrastructural maintenance. This represents a long-term entrenched failure resulting from the ambiguous division of responsibility between donors and the government in short- and long-term development intervention; we already observed this dynamic in the inception of the CEP in the 1960s in Chapter 1. The Bangladesh Water Development Board (BWDB) is responsible for infrastructural construction but not necessarily maintenance. It could also be considered the purview of the Local Government Engineering Division (LGED), although they are also responsible for construction, and their focus on maintenance is usually confined to larger infrastructures like roads, cyclone shelters, and certain large embankments. Some among the donor and government community say that local communities should be responsible for dredging their own canals. The responsibility vacuum is compounded by the fact that donors are sometimes willing to fund maintenance as part of their limited-term project activities in a given area, so the possibility of this additional funding discourages government commitments to maintenance. Despite sometimes funding such activities, donors consistently deny responsibility for them, instead expressing a preference for new and novel interventions and short-term commitments. When I talked to an official with one large USAID climate change adaptation program in Khulna,

he described at length the key role the community played in planning and management of the project interventions, including the kinds of work that would be carried out under the auspices of the project and what production systems would be promoted as a result. However, when I asked about what the boundaries of potential work might be to be carried out under the auspices of the project, he explained that water management (including canal dredging) would not fall under the possible scope of interventions they could support. He described one community that had requested that the available project funds be spent on excavating a reservoir (fulfilling the same function as a canal). However, the project staff believed that such an intervention would not improve villagers' incomes, and therefore they instead decided to connect the community with a commercial aquaculture project.

In 2014, I attended a Consultation Workshop[115] hosted by the FAO in Khulna to solicit feedback on a new project being funded by the Global Environment Fund (GEF, a global climate finance agency) to promote aquaculture as a climate change adaptation strategy. Held in a conference room in Khulna City's nicest business hotel, the meeting was attended by about 20 invited local government bureaucrats and some faculty from Khulna University, along with a group of Bangladeshi and foreign consultants hired to plan the project. One consultant explained to the gathered local experts, "we're most interested in finding out what technologies are most appropriate, what kinds of protocols to recommend, like stocking densities [in *ghers*]." Despite the consultant's request for purely technical recommendations about interventions that had already been planned, several of the attendees wanted to talk about the conflicts between rice and shrimp, and related needs for alternative water management systems. Several mentioned the need for canal

[115] The Consultation Workshop is another term for the Stakeholder Workshop mentioned in the Introduction. Both are considered obligatory components of the project conception process, although they are usually held after significant planning work has been carried out and funding commitments have been made for particular project components.

dredging to improve freshwater storage for irrigation. An official from the Department of Fisheries pressed the consultants that "canal excavation should *definitely* be a component" of the GEF project, explaining that lack of access to water due to sediment canals was the primary obstacle to production for farmers in Khulna. These recommendations were at odds with the plans that had already been developed for the project, and approved by the GEF, and were therefore not of particular use to the project team. Another of the consultants weighed in,

> "It's good to brainstorm, I have no objections to that. But we need to identify what actually needs to be done. If water logging [related to shrimp *ghers*] is the key issue, then how to identify problems and potential solutions? And then what kinds of problems might be created downstream? If it cannot be solvable, what can be done to get the farmers to adapt to the problems. If the problems are intractable or very costly [to address], then we should help farmers adapt regardless."

This statement recalls the conflicts over water logging observed in Chapter 4, but also speaks to the recurrent insistence that agriculture is no longer viable in this area, and farmers should learn to accept and adapt to shrimp aquaculture.

These widespread discourses about the unviability of agriculture do not take into account the potential for expanded irrigation through improved canal maintenance. The maps of salinity fronts discussed in Chapter 4 particularly conceal this possibility through the suggestion that the water salinity in the rivers is the salinity level of available irrigation water. Yet, as we see in Tilokpur and Polder 22, the excavation and storage of fresh water in these canals extends the possibility of dry season irrigation, facilitating year-round agricultural production.

Ongoing Mobilization

The testimonies celebrating the successes of these movements should not be mistaken for lack of contestation. Indeed, their movement to continue farming rice is ongoing, and entails vigilant and ongoing organizing efforts. Though it wasn't a common occurrence, I met two separate people in Polder 22 who told me that they had formerly been members of the landless

collectives, but that they had left because of aversion to the continuous agitation entailed in membership. One man told me he had left because he didn't like the constant fighting required of movement members, and others latter mentioned to me that he was a very "peaceful" man, and therefore wasn't inclined to the ongoing work of mobilization. Another woman told me she had left because there was ongoing violence directed at members from outsiders and some local elites, and she was afraid of the conflict, so she thought it was better to stay out of it. Another man who lived on a marginal piece of land on the embankment, and had moved to Polder 22 when he was pushed out of his home village in another polder by shrimp farming, told me that he didn't like the landless collectives because they controlled the land around the outside of the embankment, and although he could have joined one of the collectives, he would have preferred to have had a plot of land to himself. Nevertheless, even those who choose not to participate in ongoing mobilization benefit from the continued agricultural production system in the polder, and these expressions of disinterest in the movement did not translate to dissent against the agriculture it promotes.

The ongoing work of mobilization takes many forms beyond the continuous collective cultivation undertaken by landless group members, though today it is often more mundane than spectacular, as in the attack in 1990. One example of this was the introduction of a program funded by the Dutch embassy known as "Blue Gold" beginning in 2012. Polders 22 and 29 were two of several polders in which Blue Gold had planned interventions to promote new agricultural technologies, market linkages, and improved water management infrastructures in the coastal region. I met several times with staff involved in this program in both Dhaka and Khulna, and they told me repeatedly that they had no plans to promote shrimp aquaculture in Polder 22, and some articulated to me their opposition to the inequitable agrarian political economy of shrimp aquaculture. Yet, I also repeatedly heard doubts about the program from landless group members in Polders 22 and 29, who insisted that they believed the program would in fact support the

introduction (and re-introduction) of commercial shrimp cultivation in the village. Whether or not this was the intention of the planners and administrators of the program, in both communities, I heard reports that the program had targeted as beneficiaries the local elites who had opposed their movements against shrimp.

It was clear to me that these assumptions of Blue Gold's interest in promoting shrimp on the part of movement members were based on the evidence of experience, and were in this sense logical even if program staff continuously insisted on the contrary. In one particularly troubling incident in Polder 22, a landless movement member told me he had been attacked after dark in a small field he was cultivating by Blue Gold members who wanted to take over the landless groups' collectively cultivated lands and turn them into shrimp *ghers*. His broken arm hanging in a sling indicated the quite seriousness of this attack. As I spoke to other community members and Nijera Kori organizers about this incident, a modified version of this interpretation of the event seemed more likely. Indeed, there is anger among wealthier community members about the landless groups' near-monopoly of the land around the outside of the polder; although landless people have a constitutional right to *khas* lands, in many communities this right is co-opted by elite residents. Even as these residents may also be members of Blue Gold, their interests in these lands, or even possibly in shrimp cultivation, are not necessarily related to their membership in the program. I did hear from some landless group members that they were also members of Blue Gold as well (although I also heard reports from some landless members in both Polder 22 and 29 that they had been explicitly excluded as beneficiaries because of their activism against shrimp).

This mess of ambiguity and confusion over the goals, plans, and beneficiaries of Blue Gold might have been cleared up through direct and concerted communication about the program between all parties. Yet, in 2015, frustrated that the information was not forthcoming, landless groups in Polder 22 submitted an RTI application to the Khulna Blue Gold office requesting details

about the work proposed in their community under the project's purview. They received support in filing this application from local Nijera Kori officials, including completing the application and transportation to the office where it was deposited. When the information was not forthcoming, they appealed their request all the way up to the national RTI arbitrator, who ordered Blue Gold to provide the relevant documents. To attend this national adjudication in Dhaka, they received support for transportation from Nijera Kori, and also lodging in the Nijera Kori central office, which houses two small dorm rooms on its top floor for precisely this kind of activity. When the details were still not forthcoming, the landless groups appealed to this national body again, they were finally given some documentation from Blue Gold officials, although they found it to be thin and not particularly detailed, leading them not to trust its veracity and completeness. I discussing these events with one Nijera Kori organizer, I said that I had personally received more detailed reports from program staff when I visited their offices, and offered to share it with them, which might clear up what I saw as confusion over whether or not Blue Gold would be promoting shrimp or not. He looked at me as if I had misunderstood the point of their efforts; "they have to give the information directly to the landless groups; it is their right to request it and to have it." This experience of the struggle of the landless groups to understand and have a say in the interventions planned and taking place in their community is an example of how the ongoing agitation against shrimp transpires in Polder 22. Even as the violence of the early period of shrimp land grabbing has receded, the maintenance of their enhanced control in the production system requires ongoing vigilance and action. The landless group member who had been attacked explained to me that if it weren't for the collectives, the landless people would have all disappeared by now, saying "we're not afraid of the *lathi* (sticks) because we know our rights."

Incremental vs. Transformational Adaptation

The modes of resistance and collective mobilization demonstrated in Polders 22 and 29 reflect a particular imaginary of the future of this region that is at odds with the future imagined by many development agencies, and actors who participate in the adaptation regime. The political economy of rice and vegetable production in Tilokpur, as well as in Polder 22, demonstrates a vision of the possibilities for rural futures imagined by local communities that has been undermined both discursively and ecologically by the enthusiasm for shrimp production among development agencies. In particular, the vision from these villages in Khulna demonstrates a transformation toward agrarian futures, as opposed to a transformation away from them.

These divergent visions and trajectories of transformation are significant in light of widespread calls among adaptation practitioners and academics for a focus on “transformational adaptation” (Rickards and Howden 2012; Kates, Travis, and Wilbanks 2012; Haque, Dodman, and Hossain 2014; Pelling 2011). In framing the scope of the activities carried out under the banner of adaptation, experts have increasingly begun to refer to the distinct categories of "incremental adaptation" and "transformative adaptation," which are understood to be discrete paradigms that address different kinds of interventions and different timeframes of change. The IPCC Fifth Assessment Report defines the scope of and difference between these paradigms as follows:

> "Incremental adaptation refers to actions where the central aim is to maintain the essence and integrity of the existing technological, institutional, governance, and value systems, such as through adjustments to cropping systems via new varieties, changing planting times, or using more efficient irrigation. In contrast, transformational adaptation seeks to change the fundamental attributes of systems in response to actual or expected climate and its effects, often at a scale and ambition greater than incremental activities. It includes changing livelihoods from cropping to livestock or by migrating to take up a livelihood elsewhere, and also changes in our perceptions and paradigms about the nature of climate change, adaptation, and their relationship to other natural and human systems" (Noble et al. 2014, 839).

While incremental adaptation is understood to be the current *modus operandi* of climate change adaptation, calls for a paradigm shift toward transformational adaptation arise in every discussion of the path forward for adaptation in Bangladesh as well as globally. These discussions typically

involve a distinction between incremental adaptation as a short-term process (often referred to as "addressing symptoms") and transformational adaptation as a long-term process aimed at more fundamental and systemic change, while recognizing that pursuing both strategies simultaneously will be necessary. "Transformation" has become the word used to indicate a change in development priorities, and often a different vision for the future to be pursued by development agencies.

The notion of transformation carries the implication of a normative progressive orientation in both popular and scholarly usage, and many academics have also explicitly identified the concept's emancipatory possibilities (Bahadur and Tanner 2014; Bassett and Fogelman 2013; Eriksen, Nightingale, and Eakin 2015; O'Brien 2012; Smucker et al. 2015). In this vein, at a conference on climate change adaptation in Kuala Lumpur in 2014, Farah Kabir, the Country Director of ActionAid Bangladesh described transformational adaptation as "the new way to development," explaining that it would entail a "redistribution of power." Yet, like many development "buzzwords" before it (Rist 2007), transformational adaptation - what it means, and how to pursue it - remains ambiguous and elusive. Transformation to what? For whom and how?

Incremental Adaptation

In Bangladesh, programs reflecting the incremental adaptation paradigm often involve technical interventions with roots in a "business as usual" development approach. In Bangladesh, these projects often involve relatively minor technical interventions, such as the introduction of hybrid rice seeds that are considered to be more saline tolerant, or the promotion of homestead container gardens for growing vegetables in areas where the soil has become too saline to plant gardens in the ground. They are, by definition, pursued with the goal of intensifying status quo

production dynamics and power relations. For example, one report prepared by BRAC[116] for UN Women proposed alternative livelihood options that would be appropriate for promotion as climate change adaptation strategies among women in each of 20 particular upazilas in the coastal zone (BRAC 2013). In Paikgachha, their high-priority selected interventions involve the introduction of non-climate sensitive livelihoods (read: non-farm livelihoods), including manufacturing of handicrafts (for example dolls, handmade paper, and other decorative household items such as those sold at BRAC's urban department store chain, Aarong), as well as interventions that support the "extension" of aquaculture, including the collection of shrimp post-larvae from rivers and repair of nets and cages used in aquaculture . These strategies are contingent on and bolster the continuation of the particular relations of production currently existing in Paikgachha. This is precisely what makes these incremental adaptation strategies. Yet, in the sense that they also entrench dynamics of dispossession from agricultural livelihoods, they might also be seen as transformational.

Perhaps the clearest example of the effects of incremental adaptation can be found in southern Shatkhira, in the area surrounding Munshiganj, to the east of which lie Paikgachha and Dumuria. Shatkhira is iconic for its crises and its failures. After it was devastated by cyclone Aila in 2009, donors and NGOs flocked to the area to establish new climate change adaptation programs. Today the remarkable density of these programs is made visible by the signboards that line Satkhira's main highway, all the way to Munshiganj, where it ends in a dusty road through a small market, and a handful of tea stalls surrounding a wall of NGO and foreign embassy logos, photographs, and signs pointing in different directions to various adaptation program offices and demonstration sites. The Climate Smart House described in Chapter 2 is an example of one of the most celebrated and publicized incremental adaptation interventions in Munshiganj. While there

[116] Formerly the Bangladesh Rural Advancement Committee, BRAC is the largest NGO in the world.

is a great deal of celebration of hitting project targets and implementation goals through programs in this area, one donor confided to me that he considered this landscape a "graveyard of failed projects," reflecting both the sense of failure of many projects, as well as the great abundance of experiments that have made their way through the area. Moreover, the comment indicates that the adaptation regime, more than producing any particular "successful" strategy for sustainable development and continued habitation of this region, generates precisely this landscape of intervention itself - a never-ending stream of experiments with no future. Incremental adaptation programs are significant for what they represent; in their aggregation, they propose and enforce new ways of governing this landscape.

Adaptation experts who I spoke with about the timeframes of these interventions estimate that the impacts of incremental adaptation will last for somewhere between zero to twenty years. (some cite the figure as zero to five years, others say two decades might be possible), whereas transformational adaptation is designed and anticipated to generate changes that are sustainable in the much longer term. There is no clear consensus on these figures; as observed in Chapter 4, they can be based on both predictions of future environmental change, as well as normative planning assessments. Some scientists have ventured into the intersection of both, such as one recent study in Nature Climate Change that estimates a potential timeframe for the necessity of transformative adaptation of 20-50 years (Rippke et al. 2016). The expected sustainability timeframe of these interventions reflects the more systemic expectations about the sustainability of rural livelihoods in these areas in general. Incremental adaptations in coastal villages in Khulna are not expected to last longer than two decades because for many adaptation practitioners, these spaces themselves and the communities that inhabit them are not expected to last longer than two decades.

Transformational Adaptation

Development practitioners working in Bangladesh promoting climate change adaptation frequently discuss the imperative for transformational adaptation. Many experts cited to me the need for "social engineering" to effect transformational change, though exactly what this engineering would entail remains somewhat nebulous. While calls for a shift toward transformational adaptation abound in Bangladesh, concrete examples of existing transformational programs are rarely given. The need for transformation in socio-ecological systems that are perceived to be threatened with (or already experiencing) dystopia is considered to be self-evident; however, the transformations necessary to avert this are far more elusive.

In Bangladesh, the role of rural out-migration in imagining this vision of the future through transformational adaptation is stark, and rural-urban migration is one transformational adaptation strategy that is always cited. In every conversation I had with development practitioners about what transformational adaptation could look like, or how it might be pursued, they discussed the critical role of rural out-migration from Khulna. Options cited for interventions to support this migration included “planned migration,” training farmers in skills more appropriate to work in urban areas, as well as production transformations from agriculture to shrimp aquaculture and related transformations of rural economies to urban ones. One DFID official explained that they were reorganizing their programs in order to specifically address transformational adaptation, and that this would entail skills training for “transformed livelihoods” and migration from the southwest to urban areas.

This reliance on migration as an example of potential transformation is indicative of the broader normative dimensions of how transformational adaptation has come to be understood. The need for transformation is, for the adaptation regime, a way of introducing a pathway toward this particular vision of development in the time of climate change. It serves to arbitrate the kinds of futures that are deemed possible and necessary. Of all the possible kinds of socio-economic and

ecological transitions that may be conceivable in southwestern Bangladesh, when it comes to the field of transformational adaptation to climate change, moving people out of their communities appears to be the only conceivable option. Thus, transformational adaptation is indicative of the broader dynamics of how the adaptation regime is governed. While containing multiple and sometimes conflicting perspectives, it also governs the boundaries of the kind of futures or

While the idea of the need for transformation is talked about with a high degree of confidence, when it comes to specifying what this might look like, most experts become more circumspect. Many discuss the need for a combined approach involving both incremental and transformational interventions, pointing out the challenges that true transformational change will entail (for recipient communities rather than for practitioners). Many cite the inevitable disruption that will be necessary in rural communities in the southwest in order to achieve adaptation. One program staff member explained to me frankly, "You cannot do things overnight. People will suffer. Things will have to change." Discussions of necessary transformations thus entail not only assumptions about their inevitability, but also about the dispossession that will take place through and as a result of it. Another climate expert, reflecting on his organization's advocacy for recognition of migration as a climate change adaptation strategy, explained to me that the need for transformation also entails a "need to reorganize societies." In order to do this, he said, it will be necessary to confront the fact that "there will be winners and losers."

This phrase, "there will be winners and losers," is one that is repeated frequently among climate experts who are invested in the project of establishing transformational adaptation as the new adaptation paradigm. In this way, it has come to be a kind of orthodoxy of the adaptation regime. It is also reflective of the understanding that there are already winners and losers. Indeed, the people living in what is understood to be Khulna's dystopic ecology today are clearly among those who will be the "losers" in this emerging paradigm. There is some slippage in the nature of

how these losses are understood and discussed. While their supposed inevitability is attributed to the dynamics of climate change itself, the discourse of transformational adaptation indicates that the actual dynamics of dispossession will be carried out through adaptation itself, interventions that are by no means a foregone conclusion. Through the adaptation regime, the process of adaptation is rendered technical (Li 2007), and dispossession is rendered apolitical (Ferguson 1990).

Convergence of Incremental and Transformational Adaptation

While incremental and transformational adaptation are often understood to be directly in opposition to one another, a deeper analysis of the programs, their fundamental logics, and effects, suggests that they may share more ground than is recognized. While transformational adaptation proposes the overt displacement of inhabitants of the coastal zone through planned strategies for resettlement, incremental adaptation arises out of a longer-term development project that effects these agrarian dispossessions through the intensification of capitalist relations of production (McMichael 2004). An analysis of both alongside one another and their combined role in constituting the adaptation regime indicates that they are both fundamentally embedded in this development project. In this way, the convergences between the incremental and transformational adaptation paradigms reflect those of the adaptation regime with its predecessors.

The use of shrimp aquaculture as a climate change adaptation strategy offers an opportunity to examine the correspondence between these two paradigms of incremental and transformational adaptation. While no clear boundaries between the paradigms have been defined, the implications of aquaculture and its expansion in the coastal zone suggest that it could be an example of either or both, shedding light on each strategy and the nature of adaptation more generally in the coastal zone. Indeed, the rationale and discourse for the use of shrimp aquaculture

as a climate change adaptation strategy extends across both paradigms. Some proponents focus on contributions of shrimp aquaculture to rural development, suggesting an incremental approach. However, often these same proponents acknowledge the drawbacks of shrimp production and they, along with others who are aware of the agrarian dispossessions wrought by aquaculture expansion, propose that regardless of its drawbacks, it is the only option for this landscape on the brink of destruction.

Most adaptation inventories indicate that a transition to "climate smart" agriculture, meaning agrarian production that is less vulnerable to the ecological changes being experienced and anticipated due to climate change is a key platform of incremental adaptation. In many such inventories in the southwest, promoting aquaculture intensification is proposed as a viable intervention because it advances production systems that currently exist in the coastal area. In the sense that aquaculture production is also often proposed as the only viable rural future in many coastal areas, it forecloses other production systems and possible futures. This is particularly true to the extent that its expansion itself engenders dispossession of rural inhabitants (Paprocki and Cons 2014).

However, the expansion and intensification of shrimp farming also entails the fundamental transformation of socio-ecological systems in the coastal zone. To the extent that it is implicated in the forced migration of dispossessed (former) farmers, it is also a constituent part of the accepted paradigm of transformative adaptation through rural-urban migration. The affinity between these approaches is demonstrated by frequent calls from adaptation practitioners and policy makers for land use zoning in the coastal zone, which would adjudicate land use conflicts between rice agriculture and shrimp aquaculture. To be sure, the implications of zoning (and specifically its effective enforcement) are potentially transformative. If the adaptation regime governs the possible futures that can be imagined in the era of climate change, then zoning and other measures that

enforce the implementation of these futures are the regime's mechanisms to police the capacity of individuals to inhabit, resist, or participate in creating those futures.

Conclusion

The experiences of these communities in Polders 22 and 29 offer a radically different vision of the possibility of rural life in Khulna in the time of climate change. The landless group members that mobilized against and continue to resist the transition to shrimp aquaculture have drawn on their lived experiences in these communities to develop alternative visions of transformation for life and livelihoods. In this sense, the "spatial imaginaries" of these communities are constituted precisely through the particularly situated experience of agrarian production itself (Wolford 2004). Discrepancies between the visions of life in a climate changed-future that draw on spatially-situated lived experience and those that appeal to a geographically dis-embedded development teleology thus highlight the key tensions in the adaptation regime.

CONCLUSION

TOWARD A NEW POLITICAL ONTOLOGY OF CLIMATE CHANGE

In the process of enframing Khulna as a climate dystopia, the adaptation regime treats the dynamics of agrarian dispossession as externalities.[117] In so doing, it naturalizes this dispossession and, indeed, reproduces it. In contrast, in this dissertation, I have demonstrated the need to understand these dynamics collectively with climate change.

There is no question that coastal Bangladesh must grapple with the quite serious biophysical challenges presented by climate change (Bangladesh is not unique in this regard – serious, concerted climate action is a global imperative). The dynamics described here suggest ways in which the region and its inhabitants will be made dramatically more vulnerable to the impacts of climate change in the future.

We need to integrate our understanding of these different dynamics in order to account for the interrelations between them. We can only understand climate change in relation to broader, historical concerns about how landscapes and communities are shaped in ways that reflect power dynamics operating at a variety of scales. The physical sciences have been able to successfully uncover and articulate the physical processes that are driving global climate change, to a high degree of certainty (IPCC 2013). But the mechanisms of transformation at the local scale are much hazier and are difficult to untangle. Attempts to connect these local transformations to global dynamics have often marginalized their interactions with longer historical processes of change.

To that end, I argue for a new political ontological of climate change that accounts for its embeddedness within a broader historical pattern of development. To do so, I draw on Hart's distinction between "Big D" Development as an intentional post-war practice of intervention in

[117] This discussion of "enframing" draws on Mitchell (1988), and is also informed by his epistemological analysis of "externalities" (2002).

the "Third World" and the "little d" development of capitalism as an immanent global process (however spatially uneven) (Hart 2010). Drawing on Polanyi, Hart links them to one another, explaining that Development comes out of demands produced in response to development. I build on Hart's formulation by delineating "big C" and "little c" climate change. "Little c" climate change refers to the global biophysical phenomenon resulting from the increase of atmospheric carbon dioxide. "Big c" Climate Change refers to the broad scope of multiply scaled intentional discursive and material practices generated by humans to think about and act in response to climate change.

The adaptation regime is a paradigmatic example of the kinds of practices and politics that fall under the rubric of Climate Change. The activities taking place today in Khulna are part of all the things that humans do to make sense of and shape life in the time of climate change. "Big C" also involves the environmental dynamics that cause and intensify climate vulnerability but that are not themselves the result of greenhouse gas emissions. Other examples include the social and ecological impacts of biofuel production (Borras, McMichael, and Scoones 2010), carbon trading, and other practices falling under the broad umbrella of "green capitalism" (Prudham 2009; McMichael 2009; Lohmann 2009, 2011).

An examination of Climate Change also facilitates an understanding of the historical specificity of these processes, of how the impacts of climate change are produced and refracted through a variety of temporal and geographic scales.[118] Bangladesh is not more vulnerable to climate change than other communities around the world because of some "natural" proclivity of this recent global shift, nor because of its "bad latitude" (Watts 2003). As a coastal environment,

[118] This historical argument also in part takes up the challenge of Chakrabarty's third thesis in his seminal essay, "The Climate of History" – that is, "The geological hypothesis regarding the Anthropocene requires us to put global histories of capital in conversation with the species history of humans" (Chakrabarty, 2009: 212).

Khulna, for example, is threatened by cyclonic storm surges and sea level rise, just as Wall Street is (indeed, the severity of Hurricane Sandy highlights the latter's vulnerability to extreme weather). Rather, Bangladesh is more vulnerable because of a planned historical process of development within the global capitalist system. Indeed, the discourse of Climate Change, in the words of Michael Watts, "feeds the great semiotic machine that naturalizes the consequences of social exploitation" (Watts 2001, 139). To examine Climate Change in relation to these planned and intentional processes, then, is to denaturalize this exploitation, and to question its inevitability.

There is still much that can be done, through the abandonment of fossil fuels, to mitigate the worst effects of climate change. Indeed, there are no inevitable impacts of climate change. At the global scale, the possibility of greater than 1.5 degrees warming is the result of particular decisions about industrial growth and resulting emissions calculated against known effects (Rogelji et al. 2016). Likewise, at the local scale, in every community, choices are being made now to address these changes that also drive ecological transformation in the future. Recognition of this human agency must be the first step in forging a radical politics of climate justice.

EPILOGUE

ON CLIMATE JUSTICE: LESSONS FROM AGRARIAN STUDIES (AND BEYONCÉ)

Beyoncé's feminist anthem for the Black Lives Matter generation, "Formation," begins with a provocation in the form of a question: "what happened after New Orleans?" The music video opens and closes with a haunting image of Beyoncé herself standing defiantly on top of a New Orleans police cruiser being submerged in flood waters, clearly signifying the aftermath of Hurricane Katrina. In the chorus, she describes herself unapologetically as a "Texas 'bama," a reappropriated epithet referring to rural black migrants from the South, akin to "redneck" or "hick," with explicitly racial connotations. She declares: "earned all this money but they never take the country out me." There is a black cowboy with spurs strapped to his Adidas. A small boy in a black hooded sweatshirt boldly breakdances in front of a line of white cops in riot gear. Beyoncé dances, synchronized with an expanding group of women, at the bottom of an empty swimming pool. The video invokes solidarity in the face of violence - "we are literally drowning," the dancers seem to assert (or is it "we refuse to drown"?). The song is an ode to blackness in a time when young blacks are being shot in the streets (called out by an image of scrawled graffiti: "stop shooting us"). But more than that, it inserts a proud rural identity into a politics of racial and environmental justice. Beyoncé unabashedly claims her rural roots as the grounds on which she demands a reckoning with the racism linking police violence and the engineered disaster of Katrina which decimated black communities across the Gulf Coast.

Moreover, it does so with allusion to the histories of agrarian exploitation in the South in which these contemporary forms of racism are embedded. In a series of scenes, Beyoncé's signature leotards are adorned with characteristically antebellum flourishes, sitting or dancing inside what appear to be 19th century southern parlors. In another she stands dramatically in a black gown in front of the decaying columns of a southern gothic plantation mansion, flanked by

black men whose garments, including a red fez, seem to invoke those of the Jim Crow-era black mutual aid societies, whose allusions to Islam asserted both solidarity and power (Kohn 2016). Awareness of the history of rural slavery in the South, Beyoncé is telling us, is critical to our contemporary political struggles.

"Formation" is a paean, not an elegy. The refrain "ok ladies, now let's get in formation," is a call to arms for a social movement, disguised with a wink as a choreography direction. Even as Beyoncé calls out ruination, she also celebrates and incites resistance. In her tributes to black movements from the post-civil war south to Black Lives Matter, she illuminates the linkages between histories of resistance to racial and economic oppression. Her references to Katrina proclaim the relationship between these histories of oppression and contemporary ecological crisis. Understood collectively, how could we imagine any kind of climate justice in the absence of its racial and rural dimensions? Claiming the right to survive is, in this context, a radical political leveler. For Beyoncé herself to maintain a proud rural identity in service of this politics speaks to the importance of asserting the value of the survival of rural communities in the face of claims to their impending destruction in the time of climate change.

The specter of the erasure of the Gulf Coast in the aftermath of Katrina is linked with the specter of climate crisis across coastal Bangladesh. In that sense, what we might learn from Beyoncé, and from the social movements in Khulna is that a progressive politics of climate justice must contend with a politics of agrarian justice, and of the dynamics of historic and present day capitalism through which agrarian communities have become profoundly vulnerable to climate change. Any climate politics that does not embrace this recognition is part of the problem, not the solution.

WORKS CITED

Abrams, P. 1988. Notes on the Difficulty of Studying the State. *Journal of Historical Sociology* 1 (1):58-89.

Abu-Lughod, L. 2000. Locating Ethnography. *Ethnography* 1 (2):261-267.

Adams, V. 2013. *Markets of Sorrow, Labors of Faith*. Durham: Duke University Press.

Adams, V., M. Murphy, and A. E. Clarke. 2009. Anticipation: Technoscience, life, affect, temporality. *Subjectivity* 28:246-265.

ADB. 2012. Addressing Climate Change and Migration in Asia and the Pacific. Manila, Philippines: Asian Development Bank.

Adger, W. N., T. A. Benjaminsen, K. Brown, and H. Svarstad. 2001. Advancing a Political Ecology of Global Environmental Discourses. *Development and Change* 32:681-715.

Adnan, S. 1993. Shrimp-Culture Projects in Coastal Polders of Bangladesh: Policy Issues Concerning Socio-Economic and Environmental Consequences. Dhaka.

———. 1999. Agrarian Structure and Agricultural Growth Trends in Bangladesh: The Political Economy of Technological Change and Policy Interventions. In *Sonar Bangla? Agricultural Growth and Agrarian Change in West Bengal and Bangladesh*, eds. B. Rogaly, B. Harriss-White and S. Bose, 177-228. New Delhi: Sage Publications.

———. 2009. Intellectual critiques, people's resistance and inter-riparian contestations: Constraints to the power of the state regarding flood control and water management in the Ganges-Brahmaputra-Meghna delta of Bangladesh. In *Water, Sovereignty and Borders: Fresh and Salt in Asia and Oceania*, eds. D. Ghosh, H. Goodall and S. H. Donald, 104-124. London: Routledge.

———. 2013. Land grabs and primitive accumulation in deltaic Bangladesh: interactions between neoliberal globalization, state interventions, power relations and peasant resistance. *Journal of Peasant Studies* 40 (1):87-128.

Adnan, S., A. Barrett, S. N. Alam, and A. Brustinow. 1992. People's Participation, NGOs and the Flood Action Plan: An Independent Review. Dhaka: Research & Advisory Services.

Advisory Group on Development of Deltaic Areas. 1966. Appraisal of Some Aspects of the Coastal Embankment Project of East Pakistan: United Nations Economic Commission for Asia and the Far East.

Afroz, S., R. Cramb, and C. Grünbühel. 2017. Exclusion and Counter-Exclusion: The Struggle over Shrimp Farming in a Coastal Village in Bangladesh. *Development and Change*.

Afroz, T., and S. Alam. 2013. Sustainable shrimp farming in Bangladesh: A quest for an Integrated Coastal Zone Management. *Ocean & Coastal Management* 71:275-283.

Agency for International Development. 1967. Pakistan: Consulting Services for East Pakistan Water and Power Development Authority. Washington, DC: Department of State Agency for International Development.

Ahmed, A. 2011. Some of the major environmental problems relating to land use changes in the coastal areas of Bangladesh: A review. *Journal of Geography and Regional Planning* 4 (1):1-8.

Ahmed, F. H. 2017. How we can prepare ourselves for cyclones. *The Daily Star*, 31 May.

Akhter, M. 2015. The hydropolitical Cold War: The Indus Waters Treaty and state formation in Pakistan. *Political Geography* 46:65-75.

Akram-Lodhi, A. H., and C. Kay eds. 2009. *Peasants and Globalization: Political economy, rural transformation and the agrarian question*. London and New York: Routledge.

Akter, S., and B. Mallick. 96. The poverty-vulnerability-resilience nexus: Evidence from Bangladesh. *Ecological Economics* 96:114-124.

Alauddin, M., and M. Hamid. 1999. Coastal aquaculture in South Asia: Experiences and lessons. In *Devvelopment, governance and environment in South Asia: A focus on Bangladesh*, eds. M. Alauddin and S. Hasan, 289-299. London: Palgrave MacMIllan.
Ali, T. O. 2013. Experiments in Rural Development - A History. In *Bangladesh: Contested Pasts, Competing Futures*. University of Texas at Austin.
Allison, M., S. Khan, S. Goodbred, Jr, and S. Kuehl. 2003. Stratigraphic evolution of the late Holocene Ganges–Brahmaputra lower delta plain. *Sedimentary Geology* 155:317-342.
Amery, C. 1876. On Forest Rights in India. In *Report on the Proceedings of the Forest Conference held at Simla*, eds. D. Brandis and A. Smythies, 27-30. Calcutta: Office of the Superintendent of Government Printing.
Amoore, L. 2013. *The Politics of Possibility: Risk and Security Beyond Probability*. Durham: Duke University Press.
Anderson, B. 2010. Preemption, precaution, preparedness: Anticipatory action and future geographies. *Progress in Human Geography* 34 (6):777-798.
Anisuzzaman, M., B. Ahmed, A. S. Islam, and S. Hussain. 1986. *Comilla Models of Rural Development: A Quarter Century of Experience*. Comilla: BARD.
Anon. 1859. The Gangetic Delta. *The Calcutta Review* LXIII:1-20.
Ariza-Montobbio, P., S. Lele, G. Kallis, and J. Martinez-Alier. 2010. The political ecology of Jatropha plantations for biodiesel in Tamil Nadu, India. *Journal of Peasant Studies* 37 (4):875-897.
Auerbach, L., S. Goodbred, Jr, D. Mondal, C. Wilson, K. Ahmed, K. Roy, M. Steckler, C. Small, J. Gilligan, and B. Ackerly. 2015a. Flood risk of natural and embanked landscapes on the Ganges-Brahmaputra tidal delta plain. *Nature Climate Change* 5 (2):153-157.
Auerbach, L., S. Goodbred, D. Mondal, C. Wilson, K. Ahmed, K. Roy, M. Steckler, C. Small, J. Gilligan, and B. Ackerly. 2015b. Reply to 'Tidal river management in Bangladesh'. *Nature Climate Change* 5 (6):492-493.
Awal, M. 2014. Water logging in southwestern coastal region of Bangladesh: local adaptation and policy options. *Science Postprint* 1 (1).
Bagchi, S. 2014. On the dark side of Kolkata's satellite towns. *The Hindu*, 21 June.
Bahadur, A., and T. Tanner. 2014. Transformational resilience thinking: putting people, power and politics at the heart of urban climate resilience. *Environment & Urbanization* 26 (1):200-214.
Baka, J. 2013. The Political Construction of Wasteland: Governmentality, Land Acquisition and Social Inequality in South India. *Development and Change* 44 (2):409-428.
———. 2016. Making Space for Energy: Wasteland Development, Enclosures, and Energy Dispossessions. *Antipode*.
Ballu, V., M.-N. Bouin, P. Siméoni, W. C. Crawford, S. Clamant, J.-M. Boré, T. Kanas, and B. Pelletier. 2011. Comparing the role of absolute sea-level rise and vertical tectonic motions in coastal flooding, Torres Islands (Vanuatu). *PNAS* 108 (32):13019-13022.
Bandyopadhyay, A. 1987. A Note on Effect of Reclamation through Marginal Embankments on Coastal Eco-system of Sunderban. *Journal of the Indian Society of Coastal Agricultural Research* 5 (1):39-41.
Bari, K. L. 1978. *Bangladesh District Gazeteers: Khulna*. Dacca: Bangladesh Government Press.
Barnes, J., and M. R. Dove eds. 2015. *Climate Cultures: Anthropological Perspectives on Climate Change*. New Haven, CT: Yale University Press.
Barraclough, S., and A. Finger-Stich. 1996. Some Ecological and Social Implications of Commercial Shrimp Farming in Asia. *United Nations Research Institute for Social Development* 74:71.

Barrow, I. J. 2003. *Making history, drawing territory: British mapping in India, c. 1756-1905*. Oxford: Oxford University Press.
Barua, P., M. S. N. Chowdhury, and S. Sarkar. 2010. Climate Change and Its Risk Reduction by Mangrove Ecosystem of Bangladesh. *Bangladesh Research Publications Journal* 4 (3):208-225.
Bassett, T. J., and C. Fogelman. 2013. Déjà vu or something new? The adaptation concept in the climate change literature. *Geoforum* 48:42-53.
Baviskar, A. 1995. *In the Belly of the River: Tribal Conflicts over Development in the Narmada Valley*. Delhi: Oxford University Press.
BBS. 2012. Community Report: Khulna Zila. In *Population and Housing Census 2011*: Bangladesh Bureau of Statistics, Statistics and Informatics Division, Ministry of Planning.
———. 2013. *District Statistics 2011: Khulna*. Dhaka: Bangladesh Bureau of Statistics.
———. 2016a. *Report of The Survey on Investment from Remittance 2016*. Dhaka: Bangladesh Bureau of Statistics.
———. 2016b. *Statistical Pocketbook Bangladesh 2015*. Dhaka: Bangladesh Bureau of Statistics.
Belton, B. 2016. Shrimp, Prawn and the Political Economy of Social Wellbeing in Rural Bangladesh. *Journal of Rural Studies* 45:230-242.
Bengal Government. 1898. *Appendices to the Final Resolution of the Government of Bengal Upon the Famine of 1896 and 1897*. Calcutta: Bengal Secretariat Press.
Beveridge, H. 1876a. *The District of Bákarganj: Its History and Statistics*. London: Trübner & Co.
———. 1876b. Were the Sundarbans Inhabited in Ancient Times? *Journal of the Asiatic Society of Bengal* (1):71-76.
Bhattacharyya, J. 1990. Uses, values, and use values of the Sundarbans. *Agriculture and Human Values* 7 (2):34-39.
Bjornberg, A. 2016. Rohingya Territoriality in Myanmar and Bangladesh: Humanitarian Crisis and National Disordering. In *Myanmar's Mountain and Maritime Borderscapes: Local Practices, Boundary-Making and Figured Worlds*, ed. S.-A. Oh, 146-167. Singapore: ISEAS Publishing.
Black, G. 2013. Your Clothes Were Made by a Bangladeshi Climate Refugee. In *Mother Jones*.
Blair, H. 1978. Rural Development, Class Structure and Bureaucracy in Bangladesh. *World Development* 6 (1):65-82.
———. 1990. Local government and rural development in the Bengal Sundarbans: An inquiry in managing common property resources. *Agriculture and Human Values* 7 (2):40-51.
Blue Gold. 2012. Program for Integrated Sustainable Economic Development by improving the Water and Productive Sectors in selected Polders. Dhaka: Government of Bangladesh and Government of the Netherlands.
Borras Jr, S. M., and J. C. Franco. 2012. Global Land Grabbing and Trajectories of Agrarian Change: A Preliminary Analysis. *Journal of Agrarian Change* 12 (1):34-59.
Borras, S., P. McMichael, and I. Scoones. 2010. The politics of biofuels, land and agrarian change: editor's introduction. *Journal of Peasant Studies* 37 (4):575-592.
Bose, S. 1986. *Agrarian Bengal: Economy, social structure and politics, 1919-1947*. Cambridge: Cambridge University Press.
———. 1993. *Peasant Labour and Colonial Capital: Rural Bengal Since 1770*. Cambridge: Cambridge University Press.
———. 1999. Agricultural Growth and Agrarian Structure in Bengal: A Historical Overview. In *Sonar Bangla? Agricultural Growth and Agrarian Change in West Bengal and Bangladesh*, eds. B. Rogaly, B. Harriss-White and S. Bose, 41-59. New Delhi: Sage Publications.

Bose, S. R. 1972. East-West Contrast in Pakistan's Agricultural Development. In *Growth and Inequality in Pakistan*, eds. K. Griffin and A. R. Khan, 69-93. London: Palgrave Macmillan.
Boyce, J. 1987. *Agrarian Impasse in Bengal: Institutional Constraints to Technological Change*. Oxford: Oxford University Press.
Boyce, J. K. 1990. FORUM: Birth of a Megaproject: Political Economy of Flood Control in Bangladesh. *Environmental Management* 14 (4):419-428.
Braasch, G. 2017. *World View of Global Warming: Climate Change Image Library* 2005 [cited 5 June 2017]. Available from http://www.worldviewofglobalwarming.org/gallery/Asia/index.php.
BRAC. 2013. Alternative livelihood options for climate change vulnerable women group: BRAC.
Bradnock, R. W., and P. L. Saunders. 2000. Sea-level rise, subsidence and submergence: The political ecology of environmental change in the Bengal delta. In *Political Ecology: Science, Myth and Power*, eds. P. A. Stott and S. Sullivan, 66-90. Oxford: Oxford University Press.
Brammer, H. 2009. Climate Refugees: A Rejoinder. *Economic and Political Weekly* 44 (29):87.
———. 2012. *The Physical Geography of Bangladesh*. Dhaka: University Press Limited.
———. 2014a. Bangladesh's dynamic coastal regions and sea-level rise. *Climate Risk Management* 1:51-62.
———. 2014b. *Climate Change, Sea-Level Rise and Development in Bangladesh*. Dhaka: University Press Limited.
Brandis, D., and A. Smythies eds. 1876. *Report of the Proceedings of the Forest Conference Held at Simla, October 1875*. Calcutta: Office of the Superintendent of Government Printing.
Braun, B. 2015. Futures: Imagining Socioecological Transformation--An Introduction. *Annals of the Association of American Geographers* 105 (2):239-243.
Brown, S., and R. Nicholls. 2015. Subsidence and human influences in mega-deltas: The case of the Ganges-Brahmaputra-Meghna. *Science of the Total Environment* 527-528:362-374.
Brown, S., R. J. Nicholls, S. Hanson, G. Brundrit, J. A. Dearing, M. E. Dickson, S. L. Gallop, S. Gao, I. D. Haigh, J. Hinkel, and J. A. Jiménez. 2014. Shifting perspectives on coastal impacts and adaptation. *Nature Climate Change* 4 (9):752-755.
Buckely, R. B., CSI. 1906. The Navigable Waterways of India. *Journal of the Society of Arts* LIV (2780):417-458.
Buckland, C., CIE. 1901. *Bengal Under the Lieutenant-Governors*. Calcutta: SK Lahiri & Co.
Bull, J. 1823. *The Calcutta Annual Register for the Year 1821*. Calcutta: Government Gazette Press.
Byron, R. K. 2015. Budget support merits stern reforms: WB. *The Daily Star*, 19 April.
Castree, N. 2015. Geographers and the Discourse of an Earth Transformed: Influencing the Intellectual Weather or Changing the Intellectual Climate? *Geographical Research* 53 (3):244-254.
CDMP II. 2014. Trend and Impact Analysis of Internal Displacement due to the Impacts of Disaster and Climate Change. Dhaka: Comprehensive Disaster Management Programme II, Ministry of Disaster Management and Relief.
Chakrabarty, D. 2009. The Climate of History: Four Theses. *Critical Inquiry* 35:197-222.
Chakraborti, S. 2013. New Town inches closer to solar city. *The Times of India*, 2 October.
———. 2014. West Bengal seeks 'smart green city' tag for New Town. *The Times of India*, 6 July.
Chapman, G. 2007. *The Geopolitics of South Asia*. Farnham: Ashgate.
Chatterjee, P. 1994. Agrarian Relations and Communalism in Bengal, 1926-1935. In *Subaltern Studies I: Writings on South Asian History and Society*, ed. R. Guha, 9-38. Oxford: Oxford University Press.

Chatterjee, S. 1941. The Place of Geography in National Planning. *Calcutta Geographical Review* 3:63-80.
Chattopadhyaya, H. 1999. *The Mystery of the Sundarbans*. Calcutta: A Mukherjee & Co.
Chiu, S., and C. Small. 2016. Observations of Cyclone-Induced Storm Surge in Coastal Bangladesh. *Journal of Coastal Research* 32 (5):1149-1161.
Choldin, H. M. 1969. The Development Project as Natural Experiment: The Comilla, Pakistan, Projects. *Economic Development and Cultural Change* 17 (4):483-500.
Claeys, G. 2017. *Dystopia: A Natural History*. Oxford: Oxford University Press.
Clarke, D., S. Williams, M. Jahiruddin, K. Parks, and M. Salehin. 2015. Projections of on-farm salinity in coastal Bangladesh. *Environmental Science: Processes & Impacts* 17:1127-1136.
COAST. 2015. *A Tale from Climate Ground Zero: Climate Change, Land and People in Bangladesh*. Dhaka: COAST Trust.
Cohen, D. A. 2016. Petro Gotham, People's Gotham. In *Nonstop Metropolis: A New York City Atlas*, eds. R. Solnit and J. Jelly-Shapiro. Berkeley: University of California Press.
Cons, J. 2016. *Sensitive Space: Fragmented Territory at the India-Bangladesh Border*. Seattle and London: University of Washington Press.
———. ND. Staging Climate Security: Resilience, Experiment, and Spectacle in the Bangladeshi Borderlands.
Cons, J., and K. Paprocki. 2010. Contested Credit Landscapes: microcredit, self-help and self-determination in rural Bangladesh. *Third World Quarterly* 31 (4):637-654.
Corbera, E., L. Calvet-Mir, H. Hughes, and M. Paterson. 2015. Patterns of authorship in the IPCC Working Group III report. *Nature Climate Change* 6 (1):94-99.
Cross, J. 2014. *Dream Zones: Anticipating Capitalism and Development in India*. London: Pluto Press.
Danda, A. A., G. Sriskanthan, A. Ghosh, J. Bandyopadhyay, and S. Hazra. 2011. Indian Sundarbans Delta: A Vision. New Delhi, India: World Wide Fund for Nature-India.
Darby, S. E., F. E. Dunn, R. J. Nicholls, M. Rahman, and L. Riddy. 2015. A first look at the influence of anthropogenic climate change on the future delivery of fluvial sediment to the Ganges-Brahmaputra-Meghna delta. *Environmental Science: Processes & Impacts* 17:1587-1600.
Das, G. C. 1996. The Colonial Land-System in the 24 Parganas: Sundarbans, 1825-1904. *Bengal Past & Present* 115:48-65.
Das, T. K., and R. Maiti. 2010. Land Reclamation, Drainage Decay and Embankment Breaching - A Case Study along the Raimangal. *Indian Journal of Geography and Environment* 11:19-29.
Dasgupta, S. 2015. Left unattended, 5.3 million of Bangladesh's poor will be vulnerable to the effects of climate change in 2050. In *Let's Talk Development*: The World Bank.
Dasgupta, S., M. Huq, Z. H. Khan, M. M. Z. Ahmed, N. Mukherjee, M. F. Khan, and K. Pandey. 2014. Cyclones in a changing cliamte: the case of Bangladesh. *Climate and Development* 6 (2):96-110.
Dasgupta, S., F. A. Kamal, Z. H. Khan, S. Choudhury, and A. Nishat. 2014. River Salinity and Climate Change: Evidence from Coastal Bangladesh. Washington, DC: The World Bank.
Datta, A. K. 1998. *Land and Labour Relations in South-West Bangladesh: Resources, Power and Conflict*. New York: St. Martin's Press.
———. 2006. Who Benefits and at What Cost? Expanded Shrimp Culture in Bangladesh. In *Shrimp Farming and Industry: Sustainability, Trade and Livelihoods*, eds. A. A. Rahman, A. Quddus, B. Pokrant and M. L. Ali, 507-528. Dhaka: University Press Limited.

Davis, P., and S. Ali. 2014. Exploring Local Perceptions of Climate Change Impact and Adapttion in Rural Bangladesh. In *IFPRI Discussion Paper*: IFPRI.
de Heer, J. 2014. Developing Strategies for Adaptive Delta Management in the Face of Climate Change. In *Deltas in Times of Climate Change*. Rotterdam.
de Hoop, E., and S. Arora. 2017. Material meanings: 'waste' as a performative category of land in colonial India. *Journal of Historical Geography* 55:82-92.
Deb, A. K. 1998. Fake blue revolution: environmental and socio-economic impacts of shrimp culture in the coastal areas of Bangladesh. *Ocean & Coastal Management* 41:63-88.
Demeritt, D. 2001. The Construction of Global Warming and the Politics of Science. *Annals of the Association of American Geographers* 91 (2):307-337.
Derrington, E. 2015. NELD Story by Erin Derrington. In *NELD: Non-Economic Loss and Damage*.
Devine, J. 2003. The Paradox of Sustainability: Reflections on NGOs in Bangladesh. *Annal of the American Academy of Political and Social Science* 590 (Rethinking Sustainable Development):227-242.
Dey, I., R. Samaddar, and S. K. Sen. 2013. *Beyond Kolkata: Rajarhat and the Dystopia of Urban Imagination*. Delhi: Routledge India.
Dey, M. M., D. J. Spielman, A. M. Haque, M. S. Rahman, and R. A. Valmonte-Santos. 2012. Change and Diversity in Smallholder Rice-Fish Systems: Recent Evidence from Bangladesh: International Food Policy Research Institute.
Dhaka Tribune. 2014. Bangladesh world's 2nd most pro-free market country. *Dhaka Tribune*, 1 November.
Dickens, C. 1875. The Guns of Burrisaul. *All the Year Round* 14 (346):378-380.
Duflo, E., A. Banerjee, R. Glennerster, and C. Kinnan. 2013. The miracle of microfinance? Evidence from a randomized evaluation: National Bureau of Economic Research.
Dutch draw up drastic measures to defend coast against rising seas. 2008. *The New York Times*, 3 September.
Duyne, J. E. 1998. Local Initiatives: People's Water Management Practices in Rural Bangladesh. *Development Policy Review* 16:265-280.
Eales, H., ICS. 1892. *Census of 1891: Burma Report*. Rangoon: Superintendent, Government Printing, Burma.
Eardley-Wilmot, S., CIE. 1910. *Forest Life and Sport in India*. London: Edward Arnold.
Eaton, R. 1990. Human Settlement and Colonization in the Sundarbans, 1200-1750. *Agriculture and Human Values* 7 (2):12-31.
Eaton, R. M. 1993. *The Rise of Islam and the Bengal Frontier, 1204-1760*. Berkeley: University of California Press.
Edelman, M. 2013. Messy hectares: questions about the epistemology of land grabbing data. *Journal of Peasant Studies* 40 (3):485-501.
Eriksen, S. H., A. J. Nightingale, and H. Eakin. 2015. Reframing adaptation The political nature of climate change adaptation. *Global Environmental Change* 35:523-533.
Faaland, J., and J. Parkinson. 1976. *Bangladesh: The Test Case of Development*. London: C Hurst and Company.
FAO. 2015. Mapping Exercise on Water-Logging in South West of Bangladesh | Draft for Consultation. Dhaka: Food and Agriculture Organization of the United Nations.
Farbotko, C. 2010a. 'The global warming clock is ticking so see these places while you can': Voyeuristic tourism and model environmental citizens on Tuvalu's disappearing islands. *Singapore Journal of Tropical Geography* 31 (2):224-238.
———. 2010b. Wishful Sinking: Disappearing islands, climate refugees and cosmopolitan experimentation. *Asia Pacific Viewpoint* 51 (1):47-60.

Fawcus, L. 1927. *Final Report on the Khulna Settlement 1920-1926*. Calcutta: Bengal Secretariat Book Depot.
Feldman, S. 1997. NGOs and Civil Society: (Un)stated Contradictions. *Annals of the American Academy of Political Science* 554:46-65.
———. 1999. Feminist interruptions: The Silence of East Bengal in the Story of Partition. *Interventions: International Journal of Postcolonial Studies* 1 (2):167-182.
Felli, R., and N. Castree. 2012. Neoliberalising Adaptation to Environmental Change: Foresight or Foreclosure? *Environment and Planning A* 44 (1):1-4.
Ferguson, J. 1990. *The Anti-Politics Machine: Development, Depoliticization, and Bureaucratic Power in Lesotho*. Cambridge: Cambridge University Press.
Fergusson, J. 1863. On Recent Changes in the Delta of the Ganges. *Quarterly Journal of the Geological Society* 19 (1-2):321-354.
Field, C. 1885. *Landholding and the Relation of Landlord and Tenant, In Various Countries*. Calcutta: Thacker, Spink and Co.
Forsyth, T. 2013. Community-based adaptation: a review of past and future challenges. *WIREs Climate Change* 4 (5):439-446.
Foucault, M. 1980. *Power/Knowledge: Selected Interviews and Other Writings 1972-1977*. New York: Pantheon Books.
Friedmann, H., and P. McMichael. 1989. Agriculture and the State System: The rise and decline of national agricultures, 1870 to the present. *Sociologia Ruralis* 29 (2):93-117.
Gastrell, C. J., FRGS. 1868. *Statistical Report of the Districts of Jessore, Fureedpore and Backergunge*. Calcutta: Office of Superintendent of Government Printing.
Gellert, P. K. 2010. Extractive Regimes: Toward a Better Understanding of Indonesian Development. *Rural Sociology* 75 (1):28-57.
General Accounting Office. 1971. More Timely and Realistic Evaluation Needed for Capital Development Projects in Pakistan: Agency for International Development. Washington, DC: United States General Accounting Office.
Gidwani, V. 1992. 'Waste' and the Permanent Settlement in Bengal. *Economic and Political Weekly* 27 (4):PE-39-PE-46.
———. 2012. Waste/Value. In *The Wiley-Blackwell Companion to Economic Geography*, eds. T. Barnes, J. Peck and E. Sheppard, 275-288. Malden, MA: Blackwell Publishing.
Gidwani, V., and R. N. Reddy. 2011. The Aferlives of "Waste": Notes from India for a Minor History of Capitalist Surplus. *Antipode* 43 (5):1625-1658.
Gilchrist, J. 1825. *The General East India Guide and Vade Mecum*. London: Kingsbury, Parbury, & Allen.
Gilmartin, D. 2003. Water and Waste: Nature, Productivity and Colonialism in the Indus Basin. *Economic and Political Weekly* 38 (48):5057-5065.
Ginn, F. 2015. When Horses Won't Eat: Apocalypse and the Anthropocene. *Annals of the Association of American Geographers* 105 (2):1-9.
Glennon, R. 2017. The Unfolding Tragedy of Climate Change in Bangladesh. In *Scientific American*.
Goldman, M. 2005. *Imperial nature: the World Bank and struggles for social justice in the age of globalization*. New Haven: Yale University Press.
Goldstein, J. 2012. *Terra Economica*: Waste and the Production of Enclosed Nature. *Antipode* 45 (2):357-375.
Gotham, K. F. 2012. Disaster, Inc.: Privatization and Post-Katrina Rebuilding in New Orleans. *Perspectives on Politics* 10 (3):633-646.
Gramsci, A. 1971. *Selections from the Prison Notebooks*. Moscow: International Publishers.

Greenough, P. 1998. Hunter's Drowned Land: An Environmental Fantasy of the Victorian Sunderbans. In *Nature and the Orient: The Environmental History of South and Southeast Asia*, eds. R. H. Grove, V. Damodaran and S. Sangwan, 237-272. Delhi: Oxford University Press.
Grove, K. J. 2016. Catastrophe Insurance and the Biopolitics of Climate Change Adaptation. In *Reframing Climate Change: Constructing Ecological Geopolitics*, eds. S. O'Lear and S. Dalby, 171-187. London: Routledge.
Guha, R. 1982. *A Rule of Property for Bengal: An Essay on the Idea of Permanent Settlement*. Andhra Pradesh: Orient Blackswan.
Guha, R. 1990. An early environmental debate: The making of the 1878 forest act. *The Indian Economic and Social History Review* 27 (1):65-84.
Günel, G. 2016. What Is Carbon Dioxide? When Is Carbon Dioxide? *PoLAR* 39 (1):33-45.
Gupta, A., and J. Ferguson eds. 1997. *Culture, Power, Place: Explorations in Critical Anthropology*. Durham: Duke University Press.
Gupta, P. D. 1935. *Supplement to the Final Report on the Survey and Settlement Operations in the district of Khulna For the Period 1926-1927*. Alipore, Bengal: Bengal Government Press.
Haalboom, B., and D. C. Natcher. 2012. The Power and Peril of 'Vulnerability': Approaching Community Labels with Caution in Climate Change Research. *ARCTIC* 65 (3):319-327.
Hallegatte, S., A. Shah, R. Lempert, C. Brown, and S. Gill. 2012. Investment Decision Making Under Deep Uncertainty: Application to Climate Change. In *Policy Research Working Paper Series*. Washington, DC: The World Bank.
Hamilton, W. 1820. *A Geographical, Statistical, and Historical Description of Hindostan, and the Adjacent Countries*. London: John Murray.
———. 1828. *The East-India Gazetteer*. London: Parbury, Allen, and Co.
Hanebuth, T. J., H. R. Kudrass, J. Linstädter, B. Islam, and A. M. Zander. 2013. Rapid coastal subsidence in the central Ganges-Brahmaputra Delta (Bangladesh) since the 17th century deduced from submerged salt-producing kilns. *Geology* 41 (9):987-990.
Haq, M., N. Islam, R. Sobhan, M. A. Rehman, A. G. Rabbani, and A. Rehman. 1976. Growth and Causes of Regional Disparity in Pakistan. *Pakistan Economic and Social Review* 14 (1/4):265-290.
Haque, A. N., D. Dodman, and M. M. Hossain. 2014. Individual, communal and institutional responses to climate change by low-income households in Khulna, Bangladesh. *Environment & Urbanization* 26 (1):112-129.
Haque, M. 2014. Bangladesh shrimp exports to US market plummet. *New Age Bangladesh*, 21 September.
Haque, S. 2006. Salinity Problems and Crop Production in Coastal Regions of Bangladesh. *Pakistan Journal of Botany* 38 (5):1359-1365.
Haque, W. 1977. Toward a Theory of Rural Development. *Development Dialogue* 2:89-103.
Hardee, K., S. Balogh, and M. T. Villinski. 1997. Three countries' experience with Norplant introduction. *Health Policy and Planning* 12 (3):199-213.
Harris, G. 2014. As Seas Rise, Millions Cling to Borrowed Time and Dying Land. *The New York Times*, 29 March.
Harrison, H. L. 1875. *The Bengal Embankment Manual*. Calcutta: Bengal Secretariat Press.
Hart, G. 2001. Development critiques in the 1990s: *culs de sac* and promising paths. *Progress in Human Geography* 24 (4):649-658.
———. 2002a. *Disabling Globalization: Places of Power in Post-Apartheid South Africa*. Berkeley: University of California Press.

———. 2002b. Geography and development: development/s beyond neoliberalism? power, culture, political economy. *Progress in Human Geography* 26 (6):812-822.
———. 2010. D/developments after the meltdown. *Antipode* 41:117-141.
Hartmann, B. 1995. *Reproductive Rights and Wrongs: The Global Politics of Population Control and Contraceptive Choice*. Cambridge, MA: South End Press.
———. 2010. Rethinking climate refugees and climate conflict: Rhetoric, reality and the politics of policy discourse. *Journal of International Development* 22 (2):233-246.
Hartmann, B., and J. K. Boyce. 1983. *A Quiet Violence: View from a Bangladesh Village*. Dhaka: University Press Ltd.
Hashmi, T. u.-I. 1992. *Pakistan as a Peasant Utopia*. Boulder: Westview Press.
Hasina, S. 2015. 2015 is going to be a milestone in world history. *The Daily Star*, 11 January.
Heinig, R. 1892. *Working Plan of the Sunderban Government Forests: Khulna and 24-Parganas Districts, Bengal*. Calcutta: Conservator of Forests, Bengal.
Hennessy, E. 2013. Producing 'prehistoric' life: Conservation breeding and the remaking of wildlife genealogies. *Geoforum* 49:71-80.
Herz, B. K. 1984. Official Development Assistance for Population Activities: A Review. In *World Bank Staff Working Papers, Population and Development Series*. Washington, DC: The World Bank.
Hossain, E., S. Nurun Nabi, and A. Kaminksi. 2015. Climate-smart house: Housing that is cyclone resistant and food, energy and water efficient in Bangladesh. Penang, Malaysia: WorldFish.
Hossain, F., Z. H. Khan, and C. Shum. 2015. Tidal river management in Bangladesh. *Nature Climate Change* 5 (6):492.
Hossain, N. 2017. *The Aid Lab: Understanding Bangladesh's Unexpected Success*. Oxford: Oxford University Press.
Hossen, M. A., and J. R. Wagner. 2015. The need for community inclusion in water basin governance in Bangladesh. *Bandung: Journal of the Global South* 2:1-18.
HSBC-Star Junion Climate Champions in CTG. 2014. *The Daily Star*, 13 September.
Human Rights Watch. 2015. *Marry Before Your House is Swept Away: Child Marriage in Bangladesh*: Human Rights Watch.
Hunter, W. 1875a. *A Statistical Account of Bengal*. London: Trübner & Co.
———. 1875b. *A Statistical Account of Bengal*. London: Trübner & Co.
Huq, A. 1958. Reflections on Economic Planning in Pakistan. *Far Eastern Survey* 27 (1):1-6.
Huq, S., S. I. Ali, and A. A. Rahman. 1995. Sea-Level Rise and Bangladesh: A Preliminary Analysis. *Journal of Coastal Research* 14:44-53.
International Bank for Reconstruction and Development. 1970. Proposals for an Action Program: East Pakistan Agriculture and Water Development.
———. 1972a. Crops, Livestock and Fisheries. In *Land and Water Resources Sector Study: Bangladesh*.
———. 1972b. Detailed Sector Review. In *Land and Water Resources Sector Study: Bangladesh*.
———. 1972c. The Regional Development Potentials and Constraints. In *Land and Water Resources Sector Study: Bangladesh*.
———. 1972d. Water. In *Land and Water Resources Sector Study: Bangladesh*.
IOR. 1915. Bengal Embankments (Sundarbans) Law 1915, ed. I. O. R. a. P. Papers.
IPCC. 2007. Summary for Policymakers. In *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. Averyt, M. Tignor and H. Miller. Cambridge: Cambridge University Press.

———. 2013. Summary for Policymakers. In *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. T. F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S. Allen, J. J. Boschung, A. Nauels, Y. Xia, V. Bex and P. Midgley. Cambridge: Cambridge University Press.
Iqbal, I. 2010. *The Bengal Delta: Ecology, State and Social Change, 1840-1943*. New York: Palgrave Macmillan.
Ireland, P., and K. McKinnon. 2013. Strategic localism for an uncertain world: A postdevelopment approach to climate change adaptation. *Geoforum* 47:158-166.
Isenberg, N. 2016. *White Trash*. New York: Viking.
Islam, M. S., and M. Haque. 2004. The mangrove-based coastal and nearshore fisheries of Bangladesh: ecology, exploitation and management. *Reviews in Fish Biology and Fisheries* 14 (2):153-180.
Islam, R. 2016. Bangladesh river eats up land and homes, trapping poor villagers. *Thomson Reuters Foundation*, 22 June.
Islam, S., and Z. Kibria. 2006. *Unraveling KJDRP: ADB Financed Project of Mass Destruction in Southwest Coastal Region of Bangladesh*. Dhaka: Uttaran.
Ito, S. 2002. From Rice to Prawns: Economic Transformation and Agrarian Structure in Rural Bangladesh. *Journal of Peasant Studies* 29 (2):47-70.
Jasanoff, S. 2010. A New Climate for Society. *Theory, Culture & Society* 27 (2-3):233-253.
———. 2015. Imagined and Invented Worlds. In *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*, eds. S. Jasanoff and S.-H. Kim, 321-340. Chicago: University of Chicago Press.
Jasanoff, S., and S.-H. Kim eds. 2015. *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*. Chicago and London: University of Chicago Press.
Joffre, O., M. Prein, P. Tung, S. Saha, N. Hao, and M. Alam. 2010. Evolution of Shrimp Aquaculture Systems in the Coastal Zones of Bangladesh and Vietnam: a Comparison. In *Tropical Deltas and Coastal Zones: Food Production, Communities and Environment at the Land-Water Interface*, eds. C. T. Hoanh, B. Szuster, K. Suan-Pheng, A. M. Ismail and A. D. Noble, 48-63. Oxfordshire: CABI.
Kabir, R., M. Jahan, and M. A. Chowdhury. 2015. Evaluating 'Expert Opinion Method' During Development of Climatic Hotspots. Paper read at International Conference on Climate Change and Water Security, 27 December, at Dhaka, Bangladesh.
Karim, L. 2011. *Microfinance and its Discontents: Women in Debt in Bangladesh*. Minneapolis: University of Minnesota Press.
Karim, M., M. M. Z. Ahmed, R. Talukder, M. Taslim, and H. Rahman. 2006. Policy Working Paper: Dynamic Agribusiness-Focused Aquaculture for Poverty Reduction and Economic Growth in Bangladesh. Penang, Malaysia: WorldFIsh Center.
Kates, R. W., W. R. Travis, and T. J. Wilbanks. 2012. Transformational adaptation when incremental adaptations to climate change are insufficient. *Proceedings of the National Academy of Sciences of the United States of America* 109 (19):7156-7161.
Katz, C. 1995. Under the Falling Sky: Apocalyptic Environmentalism and the Production of Nature. In *Marxism in the postmodern age: confronting the new world order*, eds. A. Callari, S. Cullenberg and C. Biewener, 276-282. New York: Guilford Press.
Kautsky, K. 1988 [1899]. *The Agrarian Question, Volume I*. London: Zwan Publications.
Kay, S., J. Caesar, J. Wolf, L. Bricheno, R. Nicholls, A. S. Islam, A. Haque, A. Pardaens, and J. Lowe. 2015. Modelling the increased frequency of extreme sea levels in the Ganges-

Brahmaputra-Meghna delta due to sea level rise and other effects of climate change. *Environmental Science: Processes & Impacts* 17:1311-1322.
Khadim, F. K., K. K. Kar, P. K. Halder, M. A. Rahman, and A. M. Morshed. 2013. Integrated Water Resources Management (IWRM) Impacts in South West Coastal Zone of Bangladesh and Fact-Finding on Tidal River Management. *Journal of Water Resource and Protection* 5 (10):953-961.
Khan, A. 2013. Bangladesh -- The Most Climate Vulnerable Country. In *End Poverty in South Asia*: The World Bank.
Khan, A. H. 1974. Reflections on the Comilla Rural Development Projects: Overseas Liaison Committee.
Khan, A. R. 1979. The Comilla Model and the Integrated Rural Development Programme of Bangladesh An Experiment in 'Cooperative Capitalism'. *World Development* 7:397-422.
Khandker, S. R., G. B. Koolwal, and S. Badruddoza. 2013. How Does Competition Affect the Performance of MFIs? In *Policy Research Working Paper*. Washington, DC: The World Bank.
Khanom, T. 2016. Living on the edge. *Dhaka Tribute*, 17 September.
Khulna University. 2014. Report on Baseline Survey and Socioeconomic Analysis of the Project Area (Tala, Satkhira): Khulna University and
UNDP.
Kipling, R. 1922. *Rudyard Kipling's Verse*. Garden City, New York, Toronto: Doubleday, Page & Company.
Klein, N. 2008. *The Shock Doctrine*. New York: Picador.
———. 2014. *This Change Everything: Capitalism vs. The Climate*. New York: Simon & Schuster.
Knight, F. H. 1921. *Risk, Uncertainty, and Profit*. Boston, MA: Hart, Schaffner & Marx.
Knorr-Cetina, K. 1992. The Couch, the Cathedral, and the Laboratory: On the Relationship between Experiment and Laboratory in Science. In *Science as Practice and Culture*, ed. A. Pickering, 113-138. Chicago: University of Chicago Press.
Koch, F. G. 1991. Cyclone and coastal protection. In *Bangladesh Disaster: Issues and Perspectives*. Delft, The Netherlands.
Kohn, A. 2016. You might have missed this symbol of black wealth in Beyoncé's 'Formation'. In *Timeline*.
Koslov, L. 2016. The Case for Retreat. *Public Culture* 28 (2):359-387.
Kroodsma, D. 2015. The Delta. In *Ride for Climate*.
Lázár, A. N., D. Clarke, H. Adams, A. R. Akanda, S. Szabo, R. J. Nicholls, Z. Matthews, D. Begum, A. F. M. Saleh, M. A. Abedin, A. Payo, P. K. Streatfield, C. Hutton, M. S. Mondal, and A. Z. M. Moslehuddin. 2015. Agricultural livelihoods in coastal Bangladesh under climate and evironmental change - a model framework. *Environmental Science: Processes & Impacts* 17:1018-1031.
Leedshill-De Leuw Engineers. 1968. Coastal Embankment Project Engineering and Economic Evaluation. Dacca, East Pakistan: East Pakistan Water and Power Development Authority.
Lees, O. 1906. *Waterways in Bengal: Their Economic Value and the Methods Employed for Their Improvement*. Calcutta: The Bengal Secretariat Book Depot.
Lempert, R., N. Kalra, S. Peyraud, Z. Mao, S. B. Tan, D. Cira, and A. Lotsch. 2013. Ensuring Robust Flood Risk Management in Ho Chi Minh City. In *Policy Research Working Paper Series*. Washington, DC: The World Bank.
Lempert, R. J., S. W. Popper, and S. C. Bankes. 2003. *Shaping the next one hundred years: new methods for quantitative, long-term policy analysis*. Santa Monica, CA: RAND.

Levien, M. 2013. Regimes of Dispossession: From Steel Towns to Special Economic Zones. *Development and Change* 44 (2):381-407.
Levitas, R. 2010. *The Concept of Utopia*. Bern: Peter Lang AG.
Lewis, D. 2011. *Bangladesh: Politics, Economy and Civil Society*. Cambridge: Cambridge University Press.
Li, T. M. 2007. *The Will to Improve: Governmentality, Development, and the Practice of Politics*. Durham: Duke University Press.
———. 2014. *Land's End: Capitalist Relations on an Indigenous Frontier*. Durham: Duke University Press.
Lipschutz, R. 2017. Can Climate Change Us? *Development and Change* 48 (3):623-635.
Loftus, A. 2013. Gramsci, Nature, and the Philosophy of Praxis. In *Gramsci: Space, Nature, Politics*, eds. M. Ekers, G. Hart, S. Kipfer and A. Loftus, 178-196. Malden, MA: Wiley-Blackwell.
Lohmann, L. 2009. Climate as Investment. *Development and Change* 40 (6):1063-1083.
———. 2011. Capital and Climate Change. *Development and Change* 42 (2):649-668.
Ludden, D. 2005. Development Regimes in South Asia: History and the Governance Conundrum. *Economic and Political Weekly* 40 (37):4042-4051.
———. 2011. *An Agrarian History of South Asia*. Cambridge: Cambridge University Press.
Mackay, J. A. 1860. *From London to Lucknow*. London: Jamest Nisbet and Co.
Mackill, D. J., A. Ismail, M, A. M. Pamplona, D. L. Sanchez, J. J. Carandang, and E. M. Septiningsih. 2010. Stress Tolerant Rice Varieties for Adaptation to a Changing Climate. *Crop, Environment & Bioinformatics* 7:250-259.
Maiti, R., T. K. Das, and A. Majee. 2010. Cognition of the inter-working of processes leading to embankment breaching along the Raimangal, Sundarbans. *Water and Energy International* 67 (1):25-34.
Maitra, B. 1972. Sundarbans Delta Project and Its Role in the Economic Development of West Bengal. In *Focus on West Bengal: Problems and Prospects*, ed. D. Bhattacharyya, 126-137. Calcutta: Arghya Kusum Datta Gupta.
Mandal, A. K. 2003. *The Sundarbans of India: A Development Analysis*. New Delhi: Indus Publishing.
Marino, E., and J. Ribot. 2012. Special Issue Introduction: Adding insult to injury: Climate change and the inequities of climate intervention. *Global Environmental Change* 22:323-328.
Marshall, P. 1987. *Bengal: The British Bridgehead, Eastern India 1740-1828*. Cambridge: Cambridge University Press.
Martinez-Alier, J. 2002. *The Environmentalism of the Poor: A Study of Ecological Conflicts and Valuation*. Cheltenham, UK: Edward Elgar.
Marx, K., and F. Engels. 1998 [1846]. *The German Ideology*. Amherst, NY: Prometheus Books.
McAdam, D., S. Tarrow, and C. Tilly. 2001. *Dynamics of Contention*. Cambridge: Cambridge University Press.
McMichael, P. 1990. Incorporating Comparison within a World-Historical Perspective: An Alternative Comparative Method. *American Sociological Review* 55 (3):385-397.
———. 2004. *Development and Social Change: A Global Perspective*. Third Edition ed. Thousand Oaks: Pine Forge Press.
———. 2008. Peasants Make Their Own History, But Not Just as They Please... *Journal of Agrarian Change*:205-228.
———. 2009. Contemporary Contradictions of the Global Development Project: geopolitics, global ecology and the 'development climate'. *Third World Quarterly* 30 (1):247-262.
Micro loans can offset effects of climate change: analyst. 2014. *The Daily Star*, 16 November.

Mifflin, A. 2013. Bangladesh Is Drowning Because of Climate Change. In *HuffPost Impact Canada*.
Miller, C., and P. Edwards eds. 2001. *Changing the atmosphere: expert knowledge and environmental governance*. Cambridge: MIT Press.
Miller, C. A. 2004. Climate science and the making of a global political order. In *States of knowledge: the co-production of science and social order*, ed. S. Jasanoff. New York: Routledge.
Ministry of Agriculture, and FAO. 2013. Master Plan for Agricultural Development in the Southern Region of Bangladesh. Dhaka: Ministry of Agriculture, Government of the People's Republic of Bangladesh and Food and Agriculture Organization of the United Nations.
Mitchell, T. 1988. *Colonising Egypt*. Berkeley: University of California Press.
———. 2002. *Rule of Experts: Egypt, Techno-Politics, and Modernity*. Berkeley: University of California Press.
Mitra, I. K. 2016. Migrant Workers and Informality in Contemporary Kolkata. In *Cities, Rural Migrants and the Urban Poor: Issues of Violence and Social Justice, Research Briefs with Policy Implications*, 14-17. Kolkata: Mahanirban Calcutta Research Group.
Modi seething at Bangladeshi immigrants. 2014. *Dhaka Tribune*, 29 April.
MoEF. 2009. *Bangladesh Climate Change Strategy and Action Plan 2009*. Dhaka: Ministry of Environment and Forests, Government of the People's Republic of Bangladesh.
Moni, S. H. 2014. Black tiger supply crunch pushes up shrimp prices. *The Financial Express Bangladesh*, 24 September.
Morris, E. 2014. The Certainty of Donald Rumsfeld. *The New York Times*, 25 March.
Mottaleb, K. A., and T. Sonobe. 2011. An Inquiry into the Rapid Growth of the Garment Industry in Bangladesh. *Economic Development and Cultural Change* 60 (1):67-89.
Mozena, D. 2014. The New Bangladesh. *AmCham: Journal of the American Chamber of Commerce in Bangladesh* 7 (4):13-16.
Muhammad, A. 2006. Globlisation and Economic Transformation in a Peripheral Economy: The Bangladesh Experience. *Economic and Political Weekly* 41 (15):1459-1464.
Mukerjee, R. 1938. *The Changing Face of Bengal: A Study in Riverine Economy*. Calcutta: University of Calcutta.
Mukerjee, S. C. 1908. *Final Report on the Survey-Settlement of the Phulhaita Estate*. Calcutta: The Bengal Secretariat Book Depot.
Mukherjee, K. 1969a. Harmonious Solution of the Basic Problem of Sundarban Reclamation. *Geographical Review of India* 38 (3):311-315.
———. 1969b. Nature and Problems of Neo-Reclamation in the Sundarbans. *Geographical Review of India* 31 (4):1-9.
———. 1983. History of Settlement in the Sundarban of West Bengal. *Indian Journal of Landscape Systems* 6 (1 & 2):1-19.
Mundy, G. C., General. 1858. *Journal of a Tour in India*. London: John Murray, Albemarle Street.
Muzzini, E., and G. Aparicio. 2013. Bangladesh: The Path to Middle-Income Status from an Urban Perspective. In *Directions in Development*. Washington, DC: The World Bank.
Nakao, T., and Y. de Boer. 2015. Climate Change and a prosperous Asia. *Dhaka Tribune*, 9 January.
Nakićenović, N., J. Alcamo, G. Davis, B. de Vries, J. Fenhann, S. Gaffin, K. Gregory, A. Grübler, T. Y. Jung, T. Kram, E. L. La Rovere, L. Michaelis, S. Mori, T. Morita, W. Pepper, H. Pitcher, L. Price, K. Riahi, A. Roehrl, H.-H. Rogner, A. Sankovski, M. Schlesinger, P. Shukla, S. Smith, R. Swart, S. van Rooijen, N. Victor, and Z. Dadi. 2000. *Special Report on Emissions Scenarios. A Special Report of Working Group III of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.

Nandy, S. 1991. Socio-economic and Demographic Aspects of Natural Disasters in Bangladesh. In *Bangladesh Disaster: Issues and Perspectives*. Delft, The Netherlands.
Nasiruddin, M., and L. C. Sieghart. 2014. The hot spot. *Dhaka Tribune*, 15 March.
National Research Council. 1971. East Pakistan land and water development as related to agricutlure. Washington, DC: National Academy of Sciences, Board on Science and Technology for International Development.
Netherlands Ministry of Foreign Affairs. 1996. Bangladesh: Evaluation of the Netherlands Development Programme with Bangladesh, 1972-1996: Netherlands Ministry of Foreign Affairs.
Nicholls, R. J., and S. L. Goodbred, Jr. 2004. Towards Integrated Assessment of the Ganges-Brahmaputra Delta. Paper read at 5th International Conference on Asian Marine Geology.
Nicholls, R. J., C. Hutton, A. N. Lázár, M. M. Rahman, M. Salehin, and T. Ghosh. 2013. Understanding climate change and livelihoods in coastal Bangladesh. *Hydrolink* 2:40-42.
Nicholls, R. J., P. Whitehead, J. Wolf, M. Rahman, and M. Salehin. 2015. The Ganges-Brahmaputra-Meghna delta system: biophysical models to support analysis of ecosystem services and poverty alleviation. *Environmental Science: Processes & Impacts* 17:1016-1017.
Noble, I., S. Huq, Y. Anokhin, J. Carmin, D. Goudou, F. Lansigan, B. Osman-Elasha, and A. Villamizar. 2014. Adaptation needs and options. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. C. Field, V. Barros, D. Dokken, K. Mach, M. Mastrandrea, T. Bilir, M. Chatterjee, K. Ebi, Y. Estrada, R. Genova, B. Girma, E. Kissel, A. Levy, S. MacCracken, P. Mastrandrea and L. White, 833-868. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.
Nuruzzaman, M. 2006. Dynamics and diversity of shrimp farming in Bangladesh: technical aspects. In *Shrimp Farming and Industry: sustainability, trade and livelihoods*, eds. A. A. Rahman, A. Quddus, B. Pokrant and M. L. Ali, 431-460. Dhaka: University Press Limited.
O'Brien, K. 2012. Global environmental change II: From adaptation to deliberate transformation. *Progress in Human Geography* 36 (5):667-676.
O'Malley, L. 1908. *Bengal District Gazetteers: Khulna*. Calcutta: The Bengal Secretariat Book Depot.
Orlove, B. 2009. The past, the present and some possible futures of adaptation. In *Adapting to Climate Change: Thresholders, Values, Governance*, eds. W. N. Adger, I. Lorenzoni and K. L. O'Brien, 131-163. Cambridge: Cambridge University Press.
Ovi, I. H. 2014. Frozen food export earnings from 17% in FY14. *Dhaka Tribune*, 11 July.
Oxfam. 2010. A tale of two worlds. In *Oxfam Asia*.
Paprocki, K. 2016. 'Selling Our Own Skin:' Social dispossession through microcredit in rural Bangladesh. *Geoforum* 74:29-38.
Paprocki, K., and J. Cons. 2014. Life in a shrimp zone: aqua- and other cultures of Bangladesh's coastal landscape. *Journal of Peasant Studies* 41 (6):1109-1130.
Paprocki, K., and S. Huq. 2017. Shrimp and coastal adaptation: on the politics of climate justice. *Climate and Development*.
Pargiter, F. E., BA. 1934. *A Revenue History of the Sundarbans From 1765 to 1870*. Alipore, Bengal: Bengal Government Press.
Path to middle-income nation: organised labour market, skills building. 2014. *The Daily Star*, 6 May.

Peet, R., and M. Watts eds. 2004. *Liberation ecologies: environment, development, social movements*. 2nd ed. London: Routledge.
Pelling, M. 2011. *Adaptation to Climate Change: From resilience to transformation*. London and New York: Routledge.
Pethick, J., and J. D. Orford. 2013. Rapid rise in effective sea-level in southwest Bangladesh: Its causes and contemporary rates. *Global and Planetary Change* 111:237-245.
Phillimore, C. R., CIE, DSO. 1945. *Historical Records of the Survey of India*. Behra Dun, India: The Surveyor General of India.
Piddington, H. 1853. *A Letter to the Most Noble James Andrew, Marquis of Dalhousie, Governor General of India, on the Storm-Waves of the Cyclones in the Bay of Bengal, and their Effects in the Sunderbunds*. Calcutta: Baptist Mission Press.
Pokrant, B. 2014. Brackish Water Shrimp Farming and the Growth of Aquatic Monocultures in Coastal Bangladesh. In *Historical Perspectives of Fisheries Exploitation in the Indo-Pacific*, eds. J. Christensen and M. Tull, 107-132. Dordrecht: Springer Netherlands.
Prudham, S. 2009. Pimping climate change: Richard Branson, global warming, and the performance of green capitalism. *Environment and Planning A* 41 (7):1594-1613.
Quddus, A. 2006. Livelihood of Shrimp Fry Collectors in Bangladesh. In *Shrimp Farming and Industry: Sustainability, Trade and Livelihoods*, eds. A. A. Rahman, A. Quddus, B. Pokrant and M. L. Ali, 355-367. Dhaka: University Press Limited.
Rahman, A. 1995. *Beel Dakatia: The Environmental Consequences of a Development Disaster*. Dhaka: University Press Limited.
Rahman, A. A., Z. H. Chowdhury, and A. U. Ahmed. 2003. Environment & Security in Bangladesh. In *Environment, Development, and Human Security: Perspectives from South Asia*, ed. A. Najam, 103-128. Lanham, MD: University Press of America.
Rahman, M. A., and S. Rahman. 2015. Natural and traditional defense mechanisms to reduce climate risks in coastal zones of Bangladesh. *Weather and Climate Extremes* 7:84-95.
Rainey, H. J. 1868. What was the Sundarban originally, and when, and wherefore did its assume it existing state of utter desolation? *Proceedings of the Asiatic Society of Bengal, January to December 1868*:264-273.
——. 1872. The Lost City. *Mookerjee's Magazine* I (1-5):343-350.
——. 1874. Famines in Bengal, and the Reclamation of the Sundarban as a Means of Mitigating Them. *The Calcutta Review* 59 (118):332-349.
——. 1891. The Sundarban: Its Physical Features and Ruins. *Proceedings of the Royal Geographical Society and Monthly Record of Geography* 13 (5):273-287.
——. 1897. The Earthquake of 1737. In *The Earthquake in Bengal and Assam: Reprinted from The 'Englishman'*, ed. S. Banerji, 314-316. Calcutta: 'Englishman' Press.
Rangan, H. 2000. *Of Myths and Movements: Rewriting Chipko into Himalayan History*. London and New York: Verso.
Rashid, M., and D. R. Ara. 2015. Modernity in tradition: Reflectionso n building design and technology in the Asian vernacular. *Frontiers of Architectural Research* 4:46-55.
Rennell, J. 1781. *A Bengal Atlas: Containing maps of the theatre of war and commerce on that side of Hindoostan*. London.
——. 1788. *Memoir of a Map of Hindoostan*. 2nd ed. London: M Brown.
——. 1910. *The Journals of Major James Rennell, First Surveyor-General of India*. Calcutta: Asiatic Society.
Richards, J., and E. Flint. 1990. Long-term transformations in the Sundarbans wetlands forests of Bengal. *Agriculture and Human Values* 7 (2):17-33.

Rickards, L., and S. Howden. 2012. Transformational adaptation: agriculture and climate change. *Crop & Pasture Science* 63:240-250.
Rippke, U., J. Ramirez-Villegas, A. Jarvis, S. J. Vermeulen, L. Parker, F. Mer, B. Diekkrüger, A. J. Challinor, and M. Howden. 2016. Timescales of transformational climate change adaptation in sub-Saharan African agriculture. *Nature Climate Change* 6:605-610.
Rist, G. 2007. Development as a buzzword. *Development in Practice* 17 (4):485-491.
RMMRU, and SCMR. 2013. Migration and its climate sensitivity. Dhaka: Refugee and Migratory Movements Research Unit and Sussex Centre for Migration Research.
Rogaly, B. 1996. Micro-finance evangelism, 'destitute women', and the hard selling of a new anti-poverty formula. *Development in Practice* 6 (2):100-112.
Rogelji, J., M. den Elzen, N. Höhne, T. Fransen, H. Fekete, H. Winkler, R. Schaeffer, F. Sha, K. Riahi, and M. Meinshausen. 2016. Paris Agreement climate proposals need a boost to keep warming well below 2 °C. *Nature* 534:631-639.
Rogers, K. G., S. L. Goodbred, Jr, and D. R. Mondal. 2013. Monsoon Sedimentation on the "abandoned" tide-influenced Ganges-Brahmaputra Delta plain. *Estuarine, Coastal and Shelf Science* 131:297-309.
Roy, P. 2014. Weather goes hawwire. *The Daily Star*, 20 August.
Ruttan, V. 1997. Participation and Development. In *Institutions and Economic Development*, ed. C. Clague, 217-232. Baltimore and London: The Johns Hopkins University Press.
Saifuzzaman, M., and M. S. Alam. 2010. Changes in Physical Environment of Southwestern Coastal Bangladesh: A River Basin Approach. *Khulna University Studies*:1-7.
Salam, M. A., L. G. Ross, and C. M. Beveridge. 2003. A comparison of development opportunities for crab and shrimp aquaculture in southwestern Bangladesh, using GIS modeling. *Aquaculture* 220 (1-4):477-494.
Sarkar, S. C. 2010. *The Sundarbans: Folk Deities, Monsters and Mortals*. New Delhi: Social Science Press.
Sathi, M. C. 2016a. Anu Muhammad gets death threat twice. *Dhaka Tribune*, 13 October.
——. 2016b. What's going on? *Dhaka Tribune*, 16 October.
Schlich, W. 1876. Remarks on the Sunderbuns. *The Indian Forester* I (1):6-11.
Segal, M. 2017. The Missing Climate Change Narrative. *South Atlantic Quarterly* 116 (1):121-124.
Seton-Karr, W. 1883. Agriculture in Lower Bengal. *Journal of the Society of Arts* 31 (1582):419-446.
——. 1899. Comment on The Port of Calcutta by Sir Charles Cecil Stevens, KCSI. *Journal of the Society of Arts* 47 (2430):627-654.
Shampa, M. I. M. P. 2012. Tidal River Management (TRM) for Selected Coastal Area of Bangladesh to Mitigate Drainage Congestion. *International Journal of Scientific & Technology Research* 1 (5):1-6.
Shanin, T. 1966. The Peasantry as a Political Factor. *The Sociological Review* 14 (1):5-10.
Siddiqi, D. 2000. Miracle Worker or Womanmachine? Tracking (Trans)national Realities in Bangladeshi Factories. *Economic and Political Weekly* 35 (21/22):11-17.
Siddique, A. B. 2015. CCDB to build climate tech park next year. *Dhaka Tribune*, 26 June:Back Page.
Siddiquee, N. A., and G. Faroqi. 2016. Governance of NGOs in Bangladesh: Control Mechanisms and their limitations. In *Public Policy and Governance in Bangladesh: Forty Years of Experience*, ed. N. Ahmed, 231-244. London and New York: Routledge.
Singh, S. 2012. Common Lands Made 'Wastelands:' Making of the 'Wastelands into Common Lands: Foundation for Ecological Security.

Sivaramakrishnan, K. 1999. *Modern Forests: Statemaking and Environmental Change in Colonial Eastern India*. Stanford, CA: Stanford University Press.
Skrimshire, S. ed. 2010. *Future Ethics: Climate Change and Apocalyptic Imagination*. London: Continuum.
Smith, N. 2008. *Uneven Development: Nature, Capital, and the Production of Space*. Athens, GA: The University of Georgia Press.
Smucker, T. A., B. Wisner, A. Mascarenhas, P. Munishi, E. E. Wangui, G. Sinha, D. Weiner, C. Bwenge, and E. Lovell. 2015. Differentiated livelihoods, local institutions, and the adaptation imperative: Assessing climate change adaptation policy in Tanzania. *Geoforum* 59:39-50.
Smythies, E. 1925. *India's Forest Wealth*. London: Humphrey Milford.
Sobhan, R. 1962. The Problem of Regional Imbalance in the Economic Development of Pakistan. *Asian Survey* 2 (5):31-37.
——. 1971. Who Pays for Development? *Pakistan Forum* 1 (4):6-7.
——. 1982. *The Crisis of External Dependence: The Political Economy of Foreign Aid to Bangladesh*. Dhaka: University Press Limited.
Soussan, J. 2000. Institutional Development: Netherlands Support to the Water Sector 1988-1998.
Stalcup, M. 2015. Policing Uncertainty: On Suspicious Activity Reporting. In *Modes of Uncertainty: Anthropological Cases*, eds. L. Samimian-Darash and P. Rabinow, 69-87. Chicago and London: The University of Chicago Press.
Steele, P. 2017. As the climate changes, will Bangladesh change too? *Dhaka Tribune*.
Stijnen, J., W. Kanning, S. Jonkman, and M. Kok. 2014. The technical and financial sustainability of the Dutch polder approach. *Journal of Flood Risk Management* 7 (1):3-15.
Stocker, T. F., Q. Dahe, G.-K. Plattner, L. V. Alexander, S. K. Allen, N. L. Bindoff, F.-M. Bréon, J. A. Church, U. Cubasch, S. Emori, P. Forster, P. Friedlingstein, N. Gillett, J. M. Gregory, D. L. Hartmann, E. Jansen, B. Kirtman, R. Knutti, K. K. Kanikicharla, P. Lemke, J. Marotzke, V. Masson-Delmotte, G. A. Meehl, I. I. Mokhov, S. Piao, V. Ramaswamy, D. Randall, M. Rhein, M. Rojas, C. Sabine, D. Shindell, L. D. Talley, D. G. Vaughan, and S.-P. Xie. 2013. Technical Summary. In *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. T. F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P. Midgley. Cambridge: Cambridge University Press.
Stoler, A. L. ed. 2013. *Imperial Debris: On Ruins and Ruination*. Durham and London: Duke University Press.
Stott, C., and S. Huq. 2014. Knowledge flows in climate change adaptation: exploring friction between scales. *Climate and Development* 6 (4):382-387.
Suarez, P., F. E. Otto, N. Kalra, C. Bachofen, E. Gordon, and W. Mudenda. 2015. Loss and damage in a changing climate, Games for learning and dialogue that link HFA and UNFCCC. In *Input paper for the United Nations Office for Disaster Risk Reduction (UNISDR), Global Assessment Report on Disaster Risk Reduction*. The Hague: Red Cross Red Crescent Climate Centre.
Sur, M. 2010. Chronicles of Repression and Resilience. In *Freedom from Fear, Freedom from Want? Re-Thinking Security in Bangladesh*, eds. H. Hossain, M. Guhathakurta and M. Sur.
Swingle, H., H. Schmittou, D. Moss, and W. Rogers. 1969a. Fishculture Project Report for East Pakistan. Auburn, Alabama: Auburn University Agricultural Experiment Station.
——. 1969b. Increasing Fish Production by Improved Fishcultures: Fishculture Project Report for East Pakistan | Project AID/csd-1581, ed. USAID. Auburn, Alabama: USAID.

Swyndgedouw, E. 2010. Apocalypse Forever? Post-political Populism and the Spectre of Climate Change. *Theory, Culture & Society* 27 (2-3):213-232.
——. 2013. The Non-Political Politics of Climate Change. *ACME: An International E-Journal for Critical Geographies* 12 (1):1-8.
Syvitski, J. P., A. J. Kettner, I. Overeem, E. W. Hutton, M. T. Hannon, G. R. Brakenridge, J. Day, C. Vörösmarty, Y. Saito, L. Giosan, and R. J. Nicholls. 2009. Sinking deltas due to human activities. *Nature Geoscience* 2:681-686.
Tacoli, C. 2009. Crisis or adaptation? Migration and climate change in a context of high mobility. *Environment & Urbanization* 21 (2):513-525.
TakePart. 2017. *Hidden Connections*. Thomson Reuters Foundation 2017 [cited 23 June 2017]. Available from http://www.takepart.com/hidden-connections/.
Tanigushi, S. 1981. The Patni System-A Modern Origin of the 'Sub-Infeudation' of Bengal in the Nineteenth Century. *Hitotsubashi Journal of Economics* 22 (1):32-60.
Temple, S. R. 1880. *India in 1880*. London: John Murray.
——. 1882. *Men and Events of My Time in India*. London: John Murray.
Thomas, J. W. 1972a. Development Institutions, Projects, and Aid in the Water Development Program of East Pakistan: USAID.
Thomas, J. W. 1972b. The Development of Tubewell Irrigation in Bangladesh: An Analysis of Alternatives: United States Agency for Internatioonal Development.
——. 1972c. Public Policy in the Reconstruction and Development of Rural Bangladesh: Agency for International Development.
Tilley, H. 2011. *Africa as a Living Laboratory*. Chicago: University of Chicago Press.
Tompkins, E. L., N. Succkall, K. Vincent, R. Rahman, A. Mensah, T. Ghosh, and S. Hazra. 2017. Observed adaptation in Deltas. In *DECCMA Working Paper*: Deltas, Vulnerability and Climate Change: Migration and Adaptation, IDRC Project Number 107642.
Transit. 1848. *A Letter to the Shareholders of the East India Railway, and to the Commercial Capitalists of England and India*. London: Smith, Elder and Co.
Tsing, A. 2000. Inside the Economy of Appearances. *Public Culture* 12 (1):115-144.
Uddin, S. 2005. Privatization in Bangladesh: The Emergence of 'Family Capitalism'. *Development and Change* 36 (1):157-182.
UNDP. 2014. Initiation Plan: Increasing adaptive capacities to enhance resilience of the South-West communities. Dhaka: United Nations Development Programme, Bangladesh.
United Nations Water Control Mission to Pakistan. 1959. *Water and Power Development in East Pakistan*. New York: United Nations.
University of Dhaka. 2014. Physical and Environmental Assessment of Proposed Inclusive and Adaptive Tidal River Management (TRM++) in Selected Kobadak Catchment Areas. Dhaka: Disaster Science and Management Discipline, Earth and Environmental Sciences Faculty, University of Dhaka and UNDP.
USAID. 2009. Adapting to Coastal Climate Change: A Guidebook for Development Planners. Washington, DC.
van Ellen, W. 1991. Floods and Floodprotection. In *Bangladesh Disaster: Issues and Perspectives*. Delft, The Netherlands.
Van Schendel, W. 1982. *Peasant Mobility*. New Delhi: Manohar.
——. 2009. *A History of Bangladesh*. Cambridge: Cambridge University Press.
van Staveren, M. F., J. F. Warner, and M. S. A. Khan. 2017. Bringing in the tides. From closing down to opening up delta polders via Tidal River Management in the southwest delta of Bangladesh. *Water Policy* 19 (2):147-164.

Voysey, P. 2015. Bangladesh: An example of adapting to a harsh environment. *Dhaka Tribune*, 22 August.
Warner, J. F. 2008. The politics of flood insecurity: Framing contested river management projects, Wageningen Universiteit.
Watts, M. 2001. Black Acts. *New Left Review* 9:125-139.
——. 2003. Development and Governmentality. *Singapore Journal of Tropical Geography* 24 (1):6-34.
——. 2008. The Southern question: agrarian questions of labour and capital. In *Peasants and globalization: political economy, rural transformation and the agrarian question*, eds. A. H. Akram-Lodhi and C. Kay. London and New York: Routledge.
——. 2011. Ecologies of Rule: African Environments and the Climate of Neoliberalism. In *The Deepening Crisis: Governance Challenges after Neoliberalism*, 67-92. New York: New York University Press.
——. 2015. Now and then: the origins of political ecology and the rebirth of adaptation as a form of thought. In *The Routledge Handbook of Political Ecology*, eds. T. Perreault, G. Bridge and J. McCarthy, 19-50. Oxon and New York: Routledge.
Watts, M., and H. G. Bohle. 1993. The space of vulnerabilty: the causal structure of hunger and famine. *Progress in Human Geography* 17 (1):43-67.
Webber, S. 2013. Performative vulnerability: climate change adaptation policies and financing in Kiribati. *Environment and Planning A* 45 (11):2717-2733.
Westland, J. 1874. *A Report on the District of Jessore: Its Antiquities, Its History, and Its Commerce*. 2nd ed. Calcutta: Bengal Secretariat Press.
White, B., S. Borras, R. Hall, I. Scoones, and W. Wolford. 2012. The new enclosures: critical perspectives on corporate land deals. *Journal of Peasant Studies* 39 (3-4):619-647.
White, B., and A. Dasgupta. 2010. Agrofuels capitalism: a view from political economy. *Journal of Peasant Studies* 37 (4):16.
White, S. 1999. NGOs, Civil Society, and the State in Bangladesh: The Politics of Representing the Poor. *Development and Change* 30:307-326.
Wilson, C. A., and S. L. Goodbred, Jr. 2015. Construction and Maintenance of the Ganges-Brahmaputra-Meghna Delta: Linking Process, Morphology, and Stratigraphy. *Annual Review of Marine Science* 7:67-88.
Wolford, W. 2004. This Land Is Ours Now: Spatial Imaginaries and the Struggle for Land in Brazil. *Annals of the Association of American Geographers* 94 (2):409-424.
——. 2010. *This Land is Ours Now: Social Mobilization and the Meanings of Land in Brazil*. Durham: Duke University Press.
——. 2016. Land's End: Review. *Journal of Peasant Studies* 43 (4):950-954.
Wolford, W., S. M. Borras, Jr., R. Hall, I. Scoones, and B. White. 2013. Governing Global Land Deals: The Role of the State in the Rush for Land. *Development and Change* 44 (2):189-210.
Wong, P. P., I. J. Losada, J.-P. Gattuso, J. Hinkel, A. Khattabi, K. McInnes, Y. Saito, and A. Sallenger. 2014. Coastal systems and low-lying areas. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. C. Field, V. Barros, D. Dokken, K. Mach, M. Mastrandrea, T. Bilir, M. Chatterjee, K. Ebi, Y. Estrada, R. Genova, B. Girma, E. Kissel, A. Levy, S. MacCracken, P. Mastrandrea and L. White, 361-409. Cambridge: Cambridge University Press.
Wood, G. D. 1981. Rural Class Formation in Bangladesh 1940-1980. *Bulletin of Concerned Asian Scholars* 13 (4):2-17.

World Bank. 1984. Report and Recommendation of the President of the International Development Association to the Executive Directors on a Proposed Credit of SDR 23.4 Million to the People's Republic of Bangladesh for a Second Agricultural Research Project: The World Bank.
——. 2010. Implications of Climate Change for Fresh Groundwater Resources in Coastal Aquifers in Bangladesh. Washington, DC: World Bank.
——. 2012. World Development Report: Jobs. Washington, DC: World Bank.
——. 2014a. Bangladesh Development Update. Dhaka: World Bank,.
——. 2014b. Building Resilience for Sustainable Development of the Sundarbans. Washington, DC: The World Bank,.
——. 2015. Short TOR on Component C3: Long Term Monitoring, Research and Analysis of Bangladesh Coastal Zone (Sustainable Polders Adapted to Coastal Dynamics), ed. C. E. I. P. P. 1. Bangladesh: The World Bank.
——. 2016. Bangladesh Development Update. Dhaka: World Bank.
——. 2017. World Development Indicators 2017, ed. T. W. Bank. Washington, DC: The World Bank.
WorldFish. *Cyclone-resistant house provides food, income and shelter in Bangladesh* 2014 [cited. Available from https://www.worldfishcenter.org/content/cyclone-resistant-house-provides-food-income-and-shelter-bangladesh.
Yunus, M. 1999. *Banker to the Poor: micro-lending and the battle against world poverty*. New York: PublicAffairs.
Zeiderman, A. 2016. *Endangered City: The Politics of Security and Risk in Bogotá*. Durham and London: Duke University Press.

GLOSSARY

aman rice (আমন ধান) – Bangladesh's most important rice crop, cultivated after the monsoon

aquaculture – Controlled cultivation of aquatic animals in penned enclosures, often on former farmlands.

bagda shrimp (বাগদা চিংড়ি) – Giant tiger shrimp that survive in saltwater, existing in the wild and also cultivated in southern Bangladesh.

beel (বিল) – A marshy lowland.

bigha (বিঘা) – A variable unit of land area commonly used to measure size of farming plots. In most of Khulna, one bigha is equivalent to approximately 33 decimals, or one third of an acre.

boro lok (বড়ো লোক) – Literally "big guy." A popular colloquialism used to refer to elites with economic and/or political power.

gher (ঘের) – An enclosed area of land flooded with salt water to cultivate shrimp.

khas land (খাস জমি) – Common lands legally available for access among landless populations according to Bangladesh's constitution.

lakh (লক্ষ) – A unit in the South Asian numbering system, equivalent to one hundred thousand (written 1,00,000).

maund (মণ)– A local unit of weight standardized throughout South Asia under the British colonial government to 37.3242 kilograms. Maund per bigha is the standard unit by which yields are measured at the farm-level.

polder – Dutch word for a low-lying enclosure surrounded by protective dykes.

pucca (পাকা) – Ripe, mature, permanent. Used to refer to homes made of brick or roads paved with asphalt.

taka (টাকা) – The Bangladeshi unit of currency (denoted by the symbol ৳ or Tk). $1 USD is equivalent to approximately 80 Tk.

thana (থানা)- Term for a police station, but also referring to an area controlled by a police station; the lowest level of administrative unit in Bangladesh above the village.

upazila (উপজেলা) – An administrative sub-district.

zamindar (জামিনদার) – Traditional large landowners in Bengal. Responsible for revenue collections under the Permanent Settlement laws of British colonial administration.